AREA 317 RCRA QUARTERLY GROUND WATER MONITORING REPORT NO. 19 APRIL THROUGH JUNE 1993

WHITTAKER CORPORATION, BERMITE DIVISION FACILITY 22116 WEST SOLEDAD CANYON ROAD SANTA CLARITA, CALIFORNIA 91350 AMV PROJECT NO. 21001.40

September 14, 1993

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September 14, 1993

Mr. Alan Sorsher, P.E. California Environmental Protection Agency Department of Toxic Substances Control 1011 North Grandview Avenue Glendale, California 91201

21001.40

Subject:

Area 317 RCRA Quarterly

Nineteenth Quarterly Ground Water Monitoring Report

April through June 1993

Whittaker Corporation, Bermite Division

Dear Mr. Sorsher:

In accordance with the RCRA Closure Plan for Whittaker Corporation, Bermite Division enclosed is a copy of Area 317 Nineteenth Quarterly Ground water Monitoring report. This report is the first completed following the implementation of the ground water monitoring system described in the "Water Quality Monitoring and Response Plan for the Interim Status Area 317 Surface Impoundment," dated October 9, 1992, and approved by you in April 1993. The revised response plan was developed to meet the requirements of the revisions to Title 22.

Statistical analyses were completed for the ground water samples collected and analyzed during this sampling event. These statistical analyses showed that the established tolerance limits for pH, specific conductance, chloride, sulfate, TCE, TOC, or TOX were not exceeded.

Mr. Alan Sorsher, P.E. September 14, 1993 Page 2

Please call me if you have any questions regarding the enclosed.

Sincerely,

ACTON • MICKELSON • van DAM, INC.

Barbara J. Mickelson, P.E.

President

BJM:ecd Enclosure

cc/enc: Mr. Gordon Louttit, Esq., Whittaker Corporation

Mr. Glen AbdunNur, Bermite

Ms. Lily Herskovits, U.S. Environmental Protection Agency, Region IX

Mr. Jim Ross, California Regional Water Quality Control Board, Los Angeles Region

TABLE OF CONTENTS

	Page
LIST OF TABLES	ii
LIST OF FIGURES	ii
1.0 INTRODUCTION	. 1
2.0 GROUND WATER LEVEL MEASUREMENTS	3
3.0 SAMPLE COLLECTION AND ANALYSIS	3 3 4
4.0 GROUND WATER SAMPLE ANALYTICAL RESULTS	5 5 6
5.0 STATISTICAL ANALYSIS OF RESULTS TO DATE 5.1 Assumptions Used in the Statistical Analysis 5.2 Data Preparation 5.3 Results	7 7 8 9
6.0 SUMMARY 6.1 Ground Water Level Measurements 6.2 Ground Water Monitoring Parameters 6.3 Background Water Quality Parameters 6.4 Statistical Analysis	9 9 9 10
7.0 RECOMMENDATIONS	10
8.0 REMARKS	11
APPENDIX A. DOCUMENT SUBMITTAL CHRONOLOGY APPENDIX B. GROUND WATER SAMPLING PROCEDURES APPENDIX C. CHAIN-OF-CUSTODY FORMS APPENDIX D. SAMPLE ANALYSES REQUEST FORMS APPENDIX E. FGL QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) PROGRAM APPENDIX F. BLANK, DUPLICATE, AND SPIKE SAMPLE ANALYTICAL REPORTS APPENDIX G. ANALYTICAL REPORTS FOR BACKGROUND WATER QUALITY AND GROUND WATER MONITORING	Υ,

LIST OF TABLES

TABLE 1	POTENTIOMETRIC SURFACE ELEVATIONS
TABLE 2	GROUND WATER MONITORING PARAMETER ANALYSES FOR SAMPLES COLLECTED JUNE 9, 1993
TABLE 3	BACKGROUND WATER QUALITY PARAMETERS

LIST OF FIGURES

FIGURE 1	SITE LOCATION
FIGURE 2	AREA 317 GROUND WATER MONITORING WELL LOCATIONS AND INFERRED GROUND WATER FLOW DIRECTION (06/09/93)
FIGURE 3	POTENTIOMETRIC SURFACE ELEVATIONS (THROUGH JUNE 1993)

AREA 317 RCRA QUARTERLY GROUND WATER MONITORING REPORT NO. 19 APRIL THROUGH JUNE 1993

WHITTAKER CORPORATION, BERMITE DIVISION FACILITY 22116 WEST SOLEDAD CANYON ROAD SANTA CLARITA, CALIFORNIA 91350

1.0 INTRODUCTION

The Whittaker Corporation, Bermite Division (Whittaker) facility (site) is located at 22116 West Soledad Canyon Road in Santa Clarita, California (Figure 1). At the time operations were terminated in April 1987, Whittaker had interim status permits for 14 Resource Conservation and Recovery Act (RCRA) Hazardous Waste Management Units (HWMUs) at the site. A document entitled "Whittaker Corporation, Bermite Division, Santa Clarita, CA CAD064573108, Facility Closure Plan Modifications" (Closure Plan), was prepared by Whittaker and approved by the California Environmental Protection Agency, Department of Toxic Substances Control (Cal-EPA) and U.S. Environmental Protection Agency (U.S. EPA) on December, 28, 1987. Outlined in the Closure Plan are procedures for obtaining approval by Cal-EPA and U.S. EPA of clean closure certification for the different HWMUs, including the 317 Surface Impoundment (Area 317).

Required in the Closure Plan is the implementation of a ground water monitoring system at Area 317 capable of detecting and assessing the impact of the HWMU on the uppermost aquifer at the site. Implementation of a ground water monitoring system is described in the document entitled "Water Quality Monitoring and Response Plan for the Interim Status Area 317 Surface Impoundment," dated October 9, 1992 (Area 317 Plan). This is a revised response plan recently approved by Cal-EPA which meets the requirements of the revisions to Title 22 and expands the constituents sampled and reported.

A total of six ground water monitoring wells (MW-1, MW-3, MW-4, MW-5, MW-6, and MW-10) have been installed around Area 317 (Figure 2). Several reports detailing the location and construction of monitoring wells, sampling and analysis plans for collecting and analyzing ground water samples from the ground water monitoring wells, abandonment of monitoring well MW-4, and quarterly sampling results which have been submitted to Cal-EPA and U.S. EPA are listed in Appendix A of this report.

Quarterly ground water sampling activities were initiated on October 3, 1988, for monitoring wells MW-1, MW-3, and MW-4. The ground water monitoring program includes analyses of water samples for volatile organic compounds (VOCs). Laboratory analytical results from the third quarterly sampling event reported trichloroethene (TCE) at 4,800 micrograms per liter

(μ g/1) in the ground water sample collected from monitoring well MW-4. As a result of this detection of TCE in the sample from monitoring well MW-4, two additional monitoring wells were installed in Area 317 (MW-5 and MW-6).

The fourth quarterly monitoring event included sampling of the ground water from monitoring wells MW-1, MW-3, and MW-4. Monitoring wells MW-5 and MW-6 were not equipped for sampling during the fourth quarterly sampling event. Analytical results from the fourth quarter were similar to those reported in the third quarterly sampling event. The concentrations of VOCs reported in samples collected from monitoring wells MW-1 and MW-3 were below laboratory reporting limits; however, analysis of the ground water sample collected from monitoring well MW-4 reported TCE at $7,200 \,\mu\text{g/l}$. Analysis of ground water samples collected from monitoring well MW-4 during the fifth through twelfth quarterly sampling events reported a steady decline in TCE concentration. Based on the results of the initial four sampling events, a reduced list of chemical parameters was approved by Cal-EPA for the fifth and subsequent quarterly sampling events.

Five ground water monitoring wells (MW-1, MW-3, MW-5, MW-6, and MW-10) are currently located around Area 317 (Figure 2). The abandonment of monitoring well MW-4, which took place on May 26 through May 28, 1992, was documented in the report entitled "Area 317 RCRA Quarterly Ground Water Quality Monitoring Report No. 14." Also documented in the above-referenced report is the installation of monitoring well MW-10, which serves as a replacement for monitoring well MW-4.

Statistical analysis of indicator parameters (currently referred to as ground water monitoring parameters) was also initiated during the fifth quarterly sampling event. The ground water samples collected and analyzed for indicator parameters (ground water monitoring parameters) from monitoring wells MW-1, MW-3, and MW-4 for the initial year of monitoring were evaluated to assess whether statistically significant changes to the ground water had occurred as a result of site activities.

A Comprehensive Ground Water Monitoring Evaluation (CME) was conducted by Cal-EPA on January 24 and 25, 1990, during the sixth quarterly monitoring event. Personnel from Cal-EPA were present during all phases of the sixth quarterly monitoring event, from the taking of initial potentiometric surface elevation measurements to the sealing of the coolers containing the quarterly ground water samples.

Ground water samples for the nineteenth quarterly sampling event from the Area 317 monitoring wells were collected on June 9, 1993. The results of the nineteenth quarterly sampling and analysis event are presented in this report, together with recommendations for future quarterly sampling events. Insufficient data exist at this time to perform some of the statistics as outlined in the Area 317 Plan. Sufficient data will exist once the results to the twentieth sampling event are known, and the report detailing those results will include all the statistical analysis outlined in the Area 317 Plan.

2.0 GROUND WATER LEVEL MEASUREMENTS

Water level measurements were collected on June 7, 1993, prior to well evacuation and sampling activities. Monitoring well locations with respect to Area 317 are shown on Figure 2. Water levels were measured to the nearest 0.01 foot.

Water level elevations have decreased 58.57, 59.15, 43.83, and 44.45 feet in monitoring wells MW-1, MW-3, MW-5, and MW-6, respectively, since the initiation of RCRA ground water monitoring activities at Area 317. Water level elevations have decreased 1.36 feet in monitoring well MW-10 since it was installed. Water level elevations increased 4.45, 4.75, 4.97, 5.06, and 4.92 feet in monitoring wells MW-1, MW-3, MW-5, MW-6, and MW-10, respectively, between the eighteenth and nineteenth quarters. Table 1 summarizes potentiometric elevation data for monitoring wells in Area 317. Figure 3 graphically illustrates the changes in potentiometric surface elevations in monitoring wells MW-1, MW-3, MW-5, MW-6, and MW-10 over time.

A local ground water flow direction for June 7, 1993, has been estimated utilizing the potentiometric elevation data collected that day. Figure 2 illustrates the estimated potentiometric surface contours and the resultant estimated flow direction for June 7, 1993, which is toward the north. Based upon this data, monitoring wells MW-5, MW-6, and MW-10 are estimated to be located hydraulically downgradient from the former Area 317, and monitoring wells MW-1 and MW-3 are estimated to be located hydraulically upgradient from the former Area 317. The ground water flow direction estimated for June 7, 1993, is generally similar to the flow direction estimate presented for the previous sampling event.

3.0 SAMPLE COLLECTION AND ANALYSES

Ground water evacuation, stabilization, and sampling procedures are outlined in Appendix B.

3.1 Required Ground Water Analyses

A reduced analytical parameter testing list was approved by Cal-EPA after submittal of "Quarterly Sampling Report No. 4." As of the fifth quarter, ground water samples from monitoring wells MW-1 and MW-3 were analyzed for the following: sulfates, chlorides, total phosphate, pH, specific conductance, total organic carbon (TOC), total organic halogens (TOX), and dissolved metals (antimony, arsenic, barium, cadmium, chromium, copper, lead, mercury, selenium, and thallium) by EPA-approved methods. Ground water samples collected from monitoring wells MW-5, MW-6, and MW-10 were analyzed for pH, specific conductance, TOC, TOX, and VOCs by EPA-approved methods. With approval of the new Area 317 Plan, iron,

manganese, and sodium were added permanently, and fluoride, gross alpha, gross beta, lead, nitrate, and turbidity were added temporarily to the analytical parameter testing list while total phosphates and other metals were removed from the list.

For the April - June 1993 sampling event, the following analytical parameters were tested:

- Ground Water Monitoring Parameters: pH, specific conductance, TOC, TOX, TCE, sulfate, sodium, manganese, iron, and chloride.
- Background Water Quality Parameters: gross alpha, gross beta, nitrate, fluoride, lead, and turbidity.

All ground water samples collected during the nineteenth sampling event were submitted to FGL Environmental (FGL) in Santa Paula, California. FGL is certified by Cal-EPA to perform the ground water analyses outlined in the Closure Plan. Chain-of-custody and sample analysis request forms are included in Appendices C and D, respectively.

A description of FGL's Quality Assurance/Quality Control (QA/QC) program is provided in Appendix E. Copies of the laboratory analytical reports for all trip, field, and method blanks, and duplicate and spiked samples analyzed by FGL are provided in Appendix F.

3.2 Approved Analytical Methods

Ground water monitoring and background water quality parameters were analyzed by EPA or other approved methodologies. Analytical methodologies were presented in the "Ground Water Sampling and Analysis Plan," dated August 1988. Modifications to this plan were approved by Cal-EPA prior to the fifth quarterly sampling event. Copies of the laboratory test method protocol were included in Appendix B of "Quarterly Sampling Report No. 1," dated December 1988.

A summary of sample volumes, sample containers, and laboratory analytical methods utilized during the nineteenth sampling event is presented in Table B-3, Appendix B. Procedures regarding sample containers, sample labeling, sample collection, and field QA/QC are outlined in Appendix B.

4.0 GROUND WATER SAMPLE ANALYTICAL RESULTS

4.1 Ground Water Monitoring Parameters

Ground water samples from each monitoring well were analyzed for pH, specific conductance, chloride, iron, manganese, sodium, sulfate, TCE, TOC, and TOX to serve as ground water monitoring parameters. Table 2 summarizes the results of the ground water monitoring parameter analyses. Copies of the original laboratory data sheets are presented in Appendix G.

Laboratory pH measurements of 7.5, 7.6, 7.7, 7.7, and 7.8 were recorded for samples collected from monitoring wells MW-1, MW-3, MW-5, MW-6, and MW-10, respectively, for the nineteenth sampling event. The laboratory pH measurements recorded for samples collected from the monitoring wells during the nineteenth sampling event were generally consistent with the measurements recorded during previous sampling events.

Specific conductance measurements of 715, 627, 528, 548, and 629 micromhos per centimeter (µmhos/cm) were recorded for samples collected from monitoring wells MW-1, MW-3, MW-5, MW-6, and MW-10, respectively, for the nineteenth sampling event. The specific conductance measurements recorded during the nineteenth sampling event were consistent with measurements recorded during previous sampling events.

Manganese was reported at less than the detection limit in samples collected from all five monitoring wells. Laboratory results for iron were 0.25, 0.05, 0.16, 0.21, and 0.34 milligrams per liter (mg/l) for ground water samples collected from monitoring wells MW-1, MW-3, MW-5, MW-6, and MW-10, respectively, for the nineteenth sampling event. The results for chloride, sodium, and sulfate were somewhat higher measuring 134, 52, and 9 mg/l for MW-1, 28, 48, and 70 mg/l for MW-3, 35, 54, and 36 mg/l for MW-5, 58, 56, and 26 mg/l for MW-6, and 66, 87, and 45 mg/l for MW-10 ground water samples. As of this report, there are insufficient data with which to prepare a statistical evaluation of these numbers for manganese, iron, and sodium. However, the results for chloride and sulfate are consistent with results from previous sampling events.

Trichloroethylene was reported at less than the detection limit in samples from all five monitoring wells. These results for TCE from ground water samples from Area 317 monitoring wells were consistent with previous sampling events which tested for VOCs.

Total organic carbon was reported at < 0.5 mg/l in all samples collected from Area 317 monitoring wells during the nineteenth sampling event. The TOC measurements recorded during the nineteenth sampling event were consistent with measurements recorded during previous sampling events.

Total organic halogens were reported at $<5.0 \mu g/1$ in all samples collected from the Area 317 monitoring wells. The TOX measurements recorded for samples collected from monitoring wells MW-1, MW-3, MW-5, MW-6, and MW-10 during the nineteenth sampling event were consistent with measurements recorded during previous sampling events.

Copies of the laboratory analytical reports for the ground water monitoring parameters are included in Appendix G.

4.2 Background Water Quality Parameters

Background water quality parameters will be set after four sets of analytical data are acquired. As of this report, there are three data sets for gross alpha, gross beta, and lead, two data sets for fluoride, and one set of data for turbidity and nitrate. Only the analytical results for samples from monitoring wells MW-1 and MW-3 are needed to establish the background water quality parameters. Once sufficient data exist, these parameters will not be tested for again unless there is evidence of a release at any ground water monitoring point (i.e., a monitoring well result outside the background tolerance limits). Table 3 summarizes the results of the background water quality parameter analyses.

Lead was less than the detection limit in ground water sample results for both monitoring wells MW-1 and MW-3. Likewise, fluoride was detected at the same level in both wells; 0.2 mg/l. Nitrate, on the other hand, was analyzed at 3.9 mg/l in the ground water sample from MW-1 and 1.6 mg/l in the ground water sample from MW-3.

Turbidity in the samples from the two monitoring wells ranged from not detectable for monitoring well MW-3 to 0.4 nephelometric turbidity units (NTUs) for monitoring well MW-1. There is no existing analytical data with which to compare these sample results. As expected, these numbers are less than the field readings.

Gross alpha in samples from the two monitoring wells ranged from 2 ± 1 picocuries per liter (pC/l) (monitoring well MW-3) to 0.4 ± 1 pC/l (monitoring well MW-1). Gross beta in samples from the two monitoring wells ranged from 0.7 ± 2 pC/l (monitoring well MW-1) to 1 ± 2 pC/l (monitoring well MW-3).

Copies of the laboratory analytical reports for the background water quality parameters are included in Appendix G.

5.0 STATISTICAL ANALYSIS OF RESULTS TO DATE

As indicated in the "Ground Water Sampling and Analysis Plan," dated August 1988, and as required in 40 CFR Part 265.92, statistical analyses of the indicator parameters (currently referred to as ground water monitoring parameters) have been performed to determine whether there is a statistically significant difference in the water quality between the individual downgradient monitoring wells and the upgradient or background monitoring wells. Monitoring wells MW-1 and MW-3 are considered upgradient monitoring wells in relation to Area 317, and monitoring wells MW-5, MW-6, and MW-10 are considered downgradient monitoring wells in relation to Area 317.

After four quarters of sampling and analysis of the monitoring system, the mean, standard deviation, variance, and coefficient of variance of the four indicator (ground water monitoring) parameters were calculated. These values were reported to Cal-EPA in correspondence to Mr. Alan Sorsher, P.E., Cal-EPA, from Wenck, dated October 25, 1989. The statistical analysis, presented in the fifth through tenth quarterly sampling reports, indicated only one statistically significant difference in water quality as determined by the indicator (ground water monitoring) parameters. This was interpreted by Wenck to be caused by erroneous TOC results from the sixth quarter.

With the approval of the Area 317 Plan, dated October 1992, the statistical comparison of each downgradient monitoring well's analytical results is made against the tolerance limits for the ground water monitoring parameters. Tolerance limits have been established for seven parameters which will be addressed in this report. Three other parameters (iron, manganese, and sodium) have insufficient data with which to determine the tolerance limits. At completion of the twentieth quarter of sampling, sufficient analytical data will be available to complete statistical comparisons on a full set of parameters. The tolerance limits for the ground water monitoring parameters will be updated annually to include the latest analytical data.

Concentrations of the ground water monitoring parameters in the ground water samples collected from the Area 317 monitoring wells for the nineteenth quarter are included in Table H-1, presented in Appendix H. A summary of the quarterly statistics for each background monitoring well and the tolerance limit calculations for chloride, sulfate, TCE, TOC, TOX, specific conductance, and pH are shown in Appendix H, Tables H-2, H-3, and H-4. Graphical presentation of the statistical information is also included in Appendix H.

5.1 Assumptions Used in the Statistical Analysis

As recommended in the "RCRA Ground Water Monitoring Technical Enforcement Guidance Document," the data points that are less than the detection limit have been given a value equal to one-half the detection limit of the analyte.

Per the recommendation of the <u>Statistical Analysis of Ground Water Monitoring Data at RCRA Facilities</u>, <u>Interim Final Guidance</u> (guidance document), the statistical analysis will assume a value for the confidence coefficient (1-a) of 0.95 and a value for the proportion (y) of 0.95. This translates to a 95 percent confidence that 95 percent of future background well results will fall within the tolerance interval predicted. The tolerance limits for pH were calculated using a two-tailed distribution, and the tolerance limits for the other parameters were calculated using a one-tailed distribution. It was assumed that the data are distributed normally.

5.2 Data Preparation

The ground water sample analytical results from the two background or upgradient monitoring wells (MW-1 and MW-3) for all 19 quarters of ground water sampling to date and the three downgradient monitoring wells (MW-5, MW-6, and MW-10) for the nineteenth quarter of ground water sampling have been tabulated and prepared for statistical analysis. Seven analytes have been used in the statistical analysis: pH, specific conductance, chloride, sulfate, TCE, TOC, and TOX. Iron, sodium, and manganese will be added to the statistical analysis once sufficient data exist to allow tolerance limits to be set.

In accordance with the tolerance limit methodology used for this statistical analysis, the seven ground water monitoring parameter analytical results, which are sampled and analyzed in each quarter, are summarized by quarter and by monitoring well. Two summary statistics have been calculated: arithmetic mean and standard deviation. These quarterly statistics have been calculated such that less than detection limit values are considered to have a value of one-half the detection limit and are presented in Table H-4. These summary statistics are then utilized in calculating the tolerance limits for each of the ground water monitoring parameters.

The statistical analysis for the ground water monitoring parameters involves testing the ground water quality downgradient of Area 317 against the set of tolerance limits, i.e., that there are no excursions of the tolerance limits, which are based on the average of all the quarterly statistics for each of the seven ground water monitoring parameters for background monitoring wells MW-1 and MW-3, compared to the nineteenth quarter results for each of the downgradient monitoring wells MW-5, MW-6, and MW-10 (Table H-1).

The calculations of the quarterly statistics were performed in the same manner as was outlined in the Area 317 Plan (October 1992). The values of K were taken from the statistical tables based on the number of samples and a one-sided tolerance limit. An example calculation is included in Appendix H. Note that the pH values have not been transformed into their resulting hydrogen ion concentrations as in the past and that the value of K for the analysis of pH comes from the tables for two-sided tolerance limits.

5.3 Results

The nineteenth quarter results for each ground water monitoring parameter (for which sufficient data exist) at each downgradient monitoring well were compared to the tolerance limits based on the first through nineteenth quarter results for background monitoring wells MW-1 and MW-3. The statistical analyses indicate that there are no excursion of tolerance limits of pH, specific conductance, chloride, sulfate, TCE, TOC, or TOX in downgradient ground water quality.

Insufficient analytical data exist to set tolerance limits for the ground water monitoring parameters of iron, manganese, and sodium. However, the results from the nineteenth quarterly sampling event appear to be consistent with the limited data available.

6.0 SUMMARY

6.1 Ground Water Level Measurements

Based upon the June 7, 1993 data, the estimated direction of ground water flow is toward the north, which is generally consistent with the ground water flow direction estimated during the previous sampling event. Utilizing this data, monitoring wells MW-5, MW-6, and MW-10 are estimated to be located hydraulically downgradient form the former Area 317, and monitoring wells MW-1 and MW-3 are estimated to be located hydraulically upgradient from the former Area 317.

6.2 Ground Water Monitoring Parameters

The pH reported for samples from the five monitoring wells ranged from 7.5 (monitoring well MW-1) to 7.8 (monitoring well MW-10). The specific conductance of samples from the five monitoring wells ranged from 528 μ g/l (monitoring well MW-5) to 715 μ g/l (monitoring well MW-1). Total organic carbon was reported at less than 0.5 mg/l in samples from all five monitoring wells. Total organic halogens were reported at less than 5 μ g/l in all of the samples from the five monitoring wells.

The pH, specific conductance, TOC, and TOX results reported for the nineteenth sampling event were consistent with the results reported for the previous sampling event.

The constituent of concern for Area 317 is TCE and was reported as not detectable in samples from all five monitoring wells. This is consistent with the previous sampling event for VOCs.

As far as the new parameters of chloride, iron, manganese, sodium, and sulfates, the ground water sample results from the five monitoring wells appear to be consistent with the existing data. Indeed, chloride and sulfate are under the tolerance limits. However, an insufficient number of sampling events exist at this time to perform any meaningful analysis on the balance of the parameters.

6.3 Background Water Quality Parameters

Laboratory analysis reported lead at less than the detection limit in samples from the two background monitoring wells. These results for the samples collected from monitoring wells MW-1 and MW-3 were consistent with the results from previous sampling events.

Nitrate and fluoride concentrations ranged from 1.6 to 3.9 mg/l, and 0.2 mg/l, respectively, in samples from monitoring wells MW-1, and MW-3. Samples from monitoring wells MW-1 and MW-3 were not analyzed for these constituents in the previous sampling event.

Turbidity ranged from not detectable in the sample from monitoring well MW-3 to 0.4 NTUs for the sample from monitoring well MW-1.

Gross alpha and gross beta concentrations ranged from 0.4 ± 1 to 2 ± 1 pC/l and $0.7 \pm to 1 \pm 2$ pC/l, respectively, in samples from monitoring wells MW-1 and MW-3.

6.4 Statistical Analysis

The statistical analyses indicate that the tolerance limits are not exceeded for pH, specific conductance, chloride, sulfate, TCE, TOC, or TOX between downgradient and background ground water quality.

7.0 RECOMMENDATIONS

Based upon the data collected, current regulatory guidelines, and the professional judgment of AMV, the following recommendation is presented:

 Conduct future sampling events in accordance with the procedures set forth in the document entitled "Water Quality Monitoring and Response Plan for the Interim Status Area 317 Surface Impoundment."

8.0 REMARKS

The recommendations contained in this report represent our professional opinions. These opinions are based on currently available information and were developed in accordance with currently accepted hydrogeologic and engineering practices at this time and location. Other than this, no warranty is implied or intended.

TABLE 1

POTENTIOMETRIC SURFACE ELEVATIONS
RCRA GROUND WATER MONITORING WELLS
WHITTAKER CORPORATION, BERMITE DIVISION

Well No.	MW-1	MW-3	MW-4	MW-5	MW-6	MW-10
Top of Casing						
Elevation*	1,561.32	1,538.51	1,538.43	1,493.37	1,521.09	1,537.49
Date		1	Potentiometric S	urface Elevation	S ^a	
12/23/87	1,107.81	b				
01/27/88	1,108.03	1,109.51				
02/03/88	1,108.32	1,109.88				
02/04/88	1,108.36	1,109.14				
02/05/88	1,108.36	1,109.17				
02/09/88	1,108.24	1,109.13				
02/10/88	1,108.28	1,109.27				-
02/12/88	1,108.28	1,109.27				-
02/19/88	1,108.11	1,108.86				
03/28/88	1,107.69	1,108.23				
04/05/88	1,107.76	1,108.23				
04/12/88	1,107.66	1,108.23				
04/19/88	1,107.56	1,108.23				
04/26/88	1,107.61	1,108.23				
05/02/88	1,107.86	1,108.23				
07/27/88	1,103.58	1,104.19	1,102.61		i	
10/03/88	1,101.75	1,102.11	1,100.77			
01/23/89	1,099.82	1,100.25	1,098.92			
04/17/89	1,097.37	1,097.62	1,096.05			
07/27/89	1,094.67	1,094.85	1,093.53	1,093.02	1,093.15	
08/10/89	1,093.93	1,094.09	1,092.89	1,092.32	1,092.49	
08/18/89	1,093.62	1,093.76	1,092.64	1,092.03	1,092.19	
10/30/89	1,092.07	1,092.16	1,091.08	1,090.62	1,090.64	
01/24/90	1,090.56	1,090.54	1,089.68	1,089.17	1,089.50	
04/16/90	1,088.66	1,088.78	1,087.83	1,087.23	1,087.32	
07/16/90	1,083.56	1,083.53	1,082.29	1,081.41	1,081.85	
10/17/90	1,079.91	1,079.78	1,078.86	1,078.25	1,078.56	
01/28/91	1,076.52	1,076.54	1,075.46	1,074.64	1,074.91	
04/22/91	1,071.22	1,071.29	1,069.75	1,068.90	1,069.25	
07/17/91	1,063.63	1,063.79	1,061.66	1,060.53	1,061.14	
10/08/91	1,055.22	1,055.41	1,053.28	1,052.12	1,052.69	
01/29/92	1,051.88	1,052.29	1,050.63	1,049.76	1,050.06	1,050.57
04/20/92	1,050.47	1,050.88	1,049.33	1,048.78	1,048.92	1,049.37
07/28/92	1,046.84	1,047.40	c	1,045.14	1,045.20	1,045.77
10/19/92	1,043.87	1,044.58	c	1,042.05	1,042.13	1,042.77
01/25/93	1,044.79	1,045.61	c	1,044.22	1,043.64	1,044.29
06/07/93	1,049.24	1,050.36	°	1,049.19	1,048.70	1,049.21

^aNGVD = National Geodetic Vertical Datum.

^bMeasurement not recorded.

^eMonitoring well abandoned 05/28/92.

TABLE 2

GROUND WATER MONITORING PARAMETER ANALYSES
FOR SAMPLES COLLECTED JUNE 9, 1993

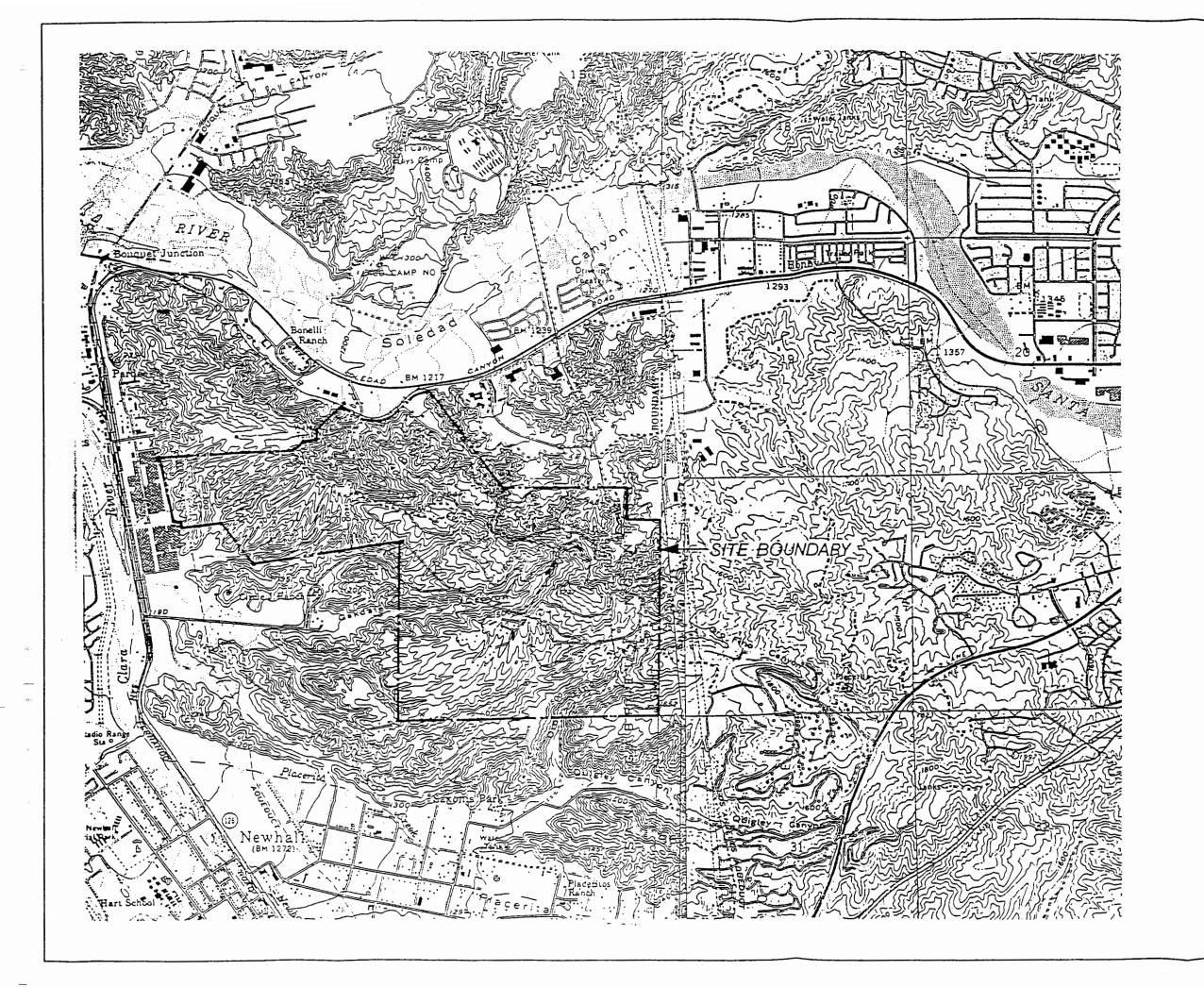
					Well No.		
Parameter	Units	Detection Limit	MW-1	MW-3	MW-5	MW-6	MW-10
pН			7.5	7.6	7.7	7.7	7.8
Specific Conductance	μmhos/cm²	1	715	627	528	548	629
Chloride	mg/l	1	134	28	35	58	66
Iron	mg/l	0.05	0.25	0.05	0.16	0.21	0.34
Manganese	mg/l	0.03	NDª	ND	ND	ND	ND
Sodium	mg/l	1	52	48	54	56	87
Sulfate	mg/l	1	9	70	36	26	45
TCE	μg/l	0.5	ND	ND	ND	ND	ND
TOC	mg/l	0.5	ND	ND	ND	ND	ND
TOX	μg/1	5	ND	ND	ND	ND	ND

^aND = Not detected.

TABLE 3 BACKGROUND WATER QUALITY PARAMETERS

	Gross Alpha (pCi/l)	Gross Beta (pCi/l)	Lead (mg/l)	Fluoride (mg/l)	Nitrate (mg/l)	Turbidity (NTU's)
Detection Limits			0.01	0.1	0.5	0.2
MW-1						
10/04/88	0.4 ± 2	0.7 ± 2	NDª	b		
01/27/93	0 ± 1	4 ± 2	ND	0.2		
06/09/93	0.4 ± 1	0.7 ± 2	ND	0.2	3.9	0.4
MW -3						
10/04/88	0.7 ± 1	2 ± 3	ND			
01/27/93	0.8 ± 1	2 ± 2	ND	0.3		
06/09/93	2 ± 1	1 ± 2	ND	0.2	1.6	ND

^aND = Not detected. ^bSample was not taken.





GENERAL NOTES:
BASE MAPS FROM U.S.G.S.
MINT CANYON & NEWHALL,
7.5 MINUTE TOPOGRAPHIC
PHOTOREVISED 1988

APPROXIMATE SITE LOCATION BOUNDAI



QUADRANGLE LOCATION

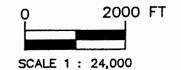


FIGURE 1

SITE LOCATION

WHITTAKER CORPORATION, BERMITE DIVISION 22116 WEST SOLEDAD CANYON ROAD SANTA CLARITA, CALIFORNIA

Project No. WHI01	Drawn By HDA	Acton * Mickelson * van Dar Consulting Scientists, Engine
File No.	Prepared By	and Geologists 5090 Robert J. Mathews Parkwa
Revision No.	Reviewed By MAA	El Dorado Hills, California 95 (916) 939-7550

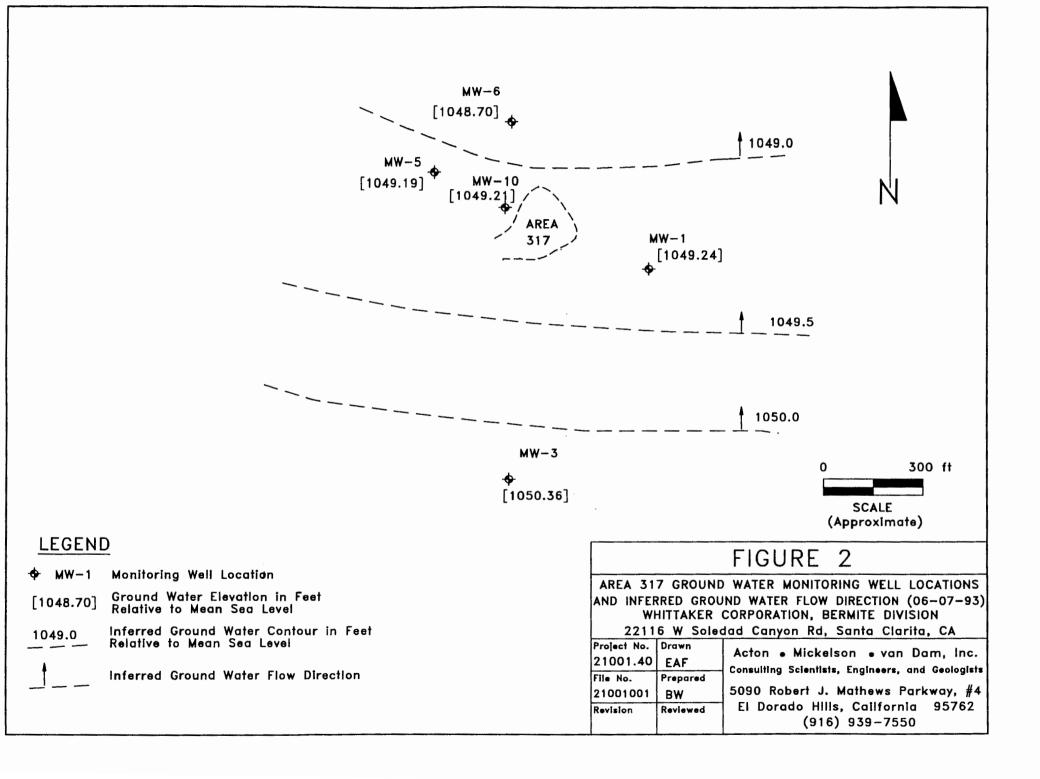
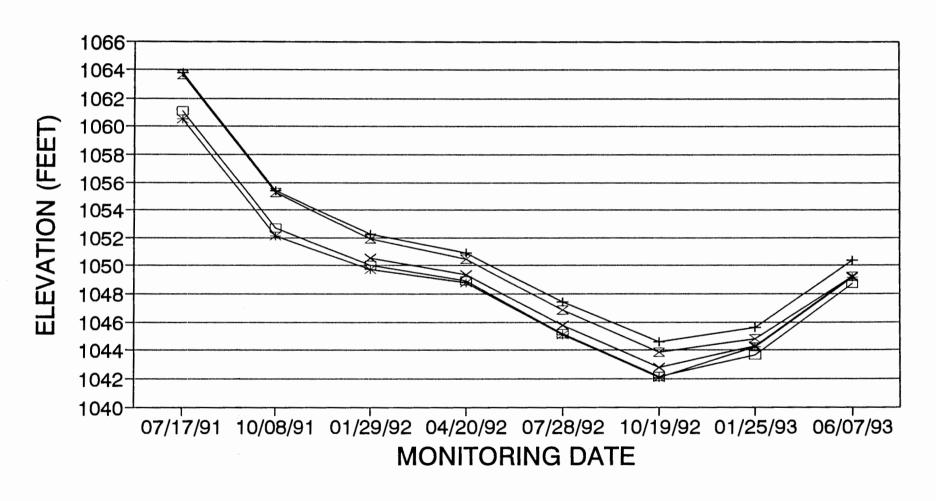
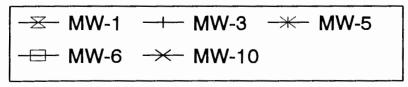


FIGURE 3 RCRA GROUND WATER MONITORING WELLS POTENTIOMETRIC SURFACE ELEVATIONS





APPENDIX A DOCUMENT SUBMITTAL CHRONOLOGY

APPENDIX A

DOCUMENT SUBMITTAL CHRONOLOGY

The following documents have been submitted to Cal-EPA and U.S. EPA, Region IX, in fulfillment of the Closure Plan regarding ground water monitoring at Areas 317 and 342:

- Whittaker Corporation, Bermite Division, Santa Clarita, CA CAD064573108, Facility Closure Plan Modifications, April 1987.
- Revised Ground Water Monitoring Plan for the 317/342 Area, October 8, 1987.
- Proposed Interim Status Ground Water Monitoring Sampling and Analysis Program, December 1987.
- Documentation Report--Construction and Development of Wells for Ground Water Monitoring of the 342 and 317 Areas, February 1988.
- Verification Sampling Results at Selected RCRA Units, March 1988.
- RCRA Ground Water Monitoring System--Proposed Final Configuration, May 1988.
- Ground Water Sampling and Analysis Plan, August 1988.
- RCRA Ground Water Sampling, Quarterly Sampling Report No. 1, December 1988.
- RCRA Ground Water Sampling, Quarterly Sampling Report No. 2, March 1989.
- RCRA Ground Water Sampling, Quarterly Sampling Report No. 3, July 1989.
- Specific Plan for a Ground Water Quality Assessment Program, June 1989.
- Interim Response Action Plan, 317 Area Soil and Ground Water Remediation, June 1989.
- Site Ground Water Sampling and Analysis Plan, Appendix IV of 40 CFR 264.
- RCRA Ground Water Sampling, Quarterly Sampling Report No. 4, September 1989.
- Statistical Analysis--Well MW-2 Versus MW-1 and MW-3, October 1989.

- RCRA Ground Water Sampling, Quarterly Sampling Report No. 5, March 1990.
- RCRA Ground Water Sampling, Quarterly Sampling Report No. 6, May 1990.
- RCRA Ground Water Sampling, Quarterly Sampling Report No. 7, June 1990.
- RCRA Ground Water Sampling, Quarterly Sampling Report No. 8, October 1990.
- RCRA Ground Water Sampling, Quarterly Sampling Report No. 9, January 1991.
- RCRA Ground Water Sampling, Quarterly Sampling Report No. 10, April 1991.
- RCRA Ground Water Sampling, Quarterly Sampling Report No. 11, July 1991.
- RCRA Ground Water Sampling, Quarterly Sampling Report No. 12, October 1991.
- Specific Plan for a Ground Water Quality Assessment Program for the 317 Surface Impoundment Area.
- RCRA Ground Water Sampling, Quarterly Sampling Report No. 13, January 1992.
- Area 317 RCRA Quarterly Ground Water Quality Monitoring Report No. 14 and Report of Monitoring Well MW-10 Installation, January through March 1992.
- Area 317 RCRA Quarterly Ground Water Quality Monitoring Report No. 15, April through June 1992.
- Area 317 RCRA Quarterly Ground Water Quality Monitoring Report No. 16, July through September 1992.
- Water Quality Monitoring and Response Plan for the Interim Status Area 317
 Surface Impoundment, October 1992.
- Area 317 RCRA Quarterly Ground Water Quality Monitoring Report No. 17, October through December 1992.
- Area 317 RCRA Quarterly Ground Water Monitoring Report No. 18, January through March 1993.

APPENDIX B GROUND WATER SAMPLING PROCEDURES

APPENDIX B

GROUND WATER SAMPLING PROCEDURES

On June 7, 1993, initial depth to water measurements were collected prior to the onset of monitoring well evacuation activities. Operation of the pumps in monitoring wells MW-1, MW-3, MW-5, MW-6, and MW-10 was then initiated to evacuate stagnant water. Pumping durations to evacuate these five monitoring wells are summarized in Table B-1. Prior to sample collection, the pumping rate for each monitoring well was reduced to approximately 100 milliliters per minute (ml/min) in a 1/4-inch-diameter tube.

In accordance with the "Ground Water Sampling and Analysis Plan," dated August 1988, evacuated ground water from monitoring wells MW-1, MW-3, MW-5, MW-6, and MW-10 was discharged to the ground surface, downgradient from each monitoring well.

Well Stabilization

Well stabilization measurements were periodically collected after well evacuation activities were initiated. Stabilization measurements for pH, temperature, turbidity, and specific conductance were taken three times prior to sampling of each well to increase the likelihood that representative ground water samples were collected. Table B-2 summarizes the results of the stabilization tests. As shown in Table B-2, the reported measurements in each monitoring well indicated a relatively stable condition prior to sampling.

Sample Containers

Sample containers used for the collection of ground water samples were supplied by Eagle Picher Environmental Services and I-Chem, Inc. The sample containers used were precleaned and sealed at these facilities and are statistically certified as clean and free of volatile organic and metal compounds. Certificates of Analysis for the sample containers used during the quarterly ground water sampling event are provided in this appendix.

Sample Labeling

Sample identification labels were filled out in the field at the time of sample collection in accordance with the "Ground Water Sampling and Analysis Plan," dated August 1988. A sample identification system was established to clearly and properly label samples. Each label identifies the monitoring well number, analytical parameter required, quarterly sampling event number, and replicate number (if required). A legend is provided in Table B-4 outlining the labeling system.

Sample Collection

Sampling Volumetric Flow Rate

A Teflon sampling valve and stem were installed into the invert of the well discharge pipe of each monitoring well to minimize aeration and agitation of the collected ground water sample. The flow rates in the monitoring wells were reduced to approximately 100 milliliters/minute (ml/min) in a 1/4-inch-diameter tube prior to sampling.

Order of Sample Collection

The ground water at each monitoring well was sampled for selected analytical parameters in the same order. This order is presented in Table B-5.

Field Sample Preservation

Ground water samples collected for TOC and TOX were preserved by adjusting the pH. A 50 percent sulfuric acid solution was added to the sample containers after filtration of the ground water sample to lower the pH. The pH of the water sample was monitored with an electric pH meter as the acid was added with a small pipette. Acid was added until a pH of less than 2 was achieved.

Following collection, labeling, and sealing, each individual ground water sample was placed in a refrigerator and locked. Samples were placed on ice in a cooler following collection and delivered to the laboratory on June 9, 1993.

Field and Trip Sample Blanks

During each quarterly sampling event, field and trip blanks were analyzed for TCEs, TOCs, and TOXs in accordance with the "Ground Water Sampling and Analysis Plan," dated August 1988.

The trip blanks were prepared in the laboratory, transferred to the site in coolers, stored in the refrigerator overnight, transferred to each sampling location during sampling activities, and stored with collected ground water samples throughout the sampling event and delivered to the laboratory.

The field blanks are prepared in the field using water provided by the analytical laboratory. These field blanks, once prepared, were stored with the ground water samples throughout the sampling event and delivered to the laboratory.

FIELD QA/QC

Washing of Field Test Equipment

To minimize the potential for cross-contamination between well samples, field equipment used during sampling activities was decontaminated between each well. Decontamination procedures involved cleaning and rinsing with deionized water before and after each sample was collected at each well. The mercury thermometer, pH probe, sulfuric acid eye droppers, turbidity meter, specific conductance probe, and the water level meter probe were all decontaminated between samples.

Unused sampling gloves were worn by sampling personnel prior to sealing the sample containers with the chain-of-custody seals.

Sample Container Labeling and Seals

As previously stated, the sample containers were labeled in the field as each sample was collected. A unique sample identification number was assigned to each ground water sample. Chain-of-custody seals were then placed on the sample containers after sampling and labeling. The ground water samples were placed on ice in a cooler, and the cooler was sealed with chain-of-custody seals prior to shipment to the laboratory.

Chain-of-Custody and Sample Analysis Request Forms

Chain-of-custody forms were filled out at the time of sample collection and were kept with the samples until they were delivered to the laboratory. Copies of the signed chain-of-custody forms are provided in Appendix C.

Sample analysis request forms were also filled out at the time of sample collection and were kept with the samples until they were delivered to the laboratory. Sample analysis request forms are used to inform the laboratory of the analysis to run on each ground water sample. Copies of the sample analysis request forms are provided in Appendix D.

Delivery of Samples to Laboratory

Ground water samples were delivered to FGL in Santa Paula, California, by personnel of Whittaker after sampling activities were completed. FGL is approximately 45 minutes by car from the site. Maximum and minimum thermometers were placed in each cooler for temperature verification. Upon arrival at the laboratory, the temperature was recorded on the sample analysis request form. The temperature of the samples was kept below 4° C.

Security

Security measures were implemented to minimize the likelihood that unauthorized personnel had access to the wells or ground water samples before, during, or after sampling activities. The site is fenced-in with locking gates and has 24-hour security personnel present. Each monitoring well has a locking cap to deter unauthorized access to the well. The ground water samples were handled by Whittaker personnel only during sampling activities and delivery to FGL.

TABLE B-1

AREA 317 WELL EVACUATION
BERMITE DIVISION, WHITTAKER CORPORATION

		Evacuation	Sampling*		
Well Number	Date Pump Started	Approximate Duration of Pumping (hours)	Duration of Pumping (minutes)	Time and Date of Sample Collection	
MW-1	06/08/93	24	11	1120 (06/09/93)	
MW-3	06/08/93	24	11	1100 (06/09/93)	
MW-5	06/08/93	24	9	1155 (06/09/93)	
MW-6	06/08/93	24	10	1210 (06/09/93)	
MW-10	06/08/93	24	6	1145 (06/09/93)	

^aFlow rate from wells was reduced prior to sampling. Actual sample extraction flow rate for all wells approximately 100 milliliter/minute in a 1/4-inch pipe.

TABLE B-2 WELL STABILIZATION TESTS BERMITE DIVISION, WHITTAKER CORPORATION

Well	Turbidity (NTU's)*	Temperature (° C.)	рН	Specific Conductance (μmhos) ^b	Time and Date
MW-1	4.95	23.4	6.66	706	1410 - 06/08/93
	1.74	22.8	7.39	718	0740 - 06/09/93
	1.45	23.3	7.67	713	1030 - 06/09/93
MW-3	0.92	24.6	7.00	633	1400 - 06/08/93
	0.75	24.0	6.78	629	0730 - 06/09/93
	0.75	24.5	7.19	626	1020 - 06/09/93
MW-5	3.14	23.7	7.05	522	1420 - 06/08/93
	1.36	23.2	7.57	534	0750 - 06/09/93
	1.12	23.7	7.86	535	1040 - 06/09/93
MW-6	9.73	24.2	7.35	546	1425 - 06/08/93
	3.05	23.7	7.58	550	0755 - 06/09/93
	2.81	24.0	7.91	550	1045 - 06/09/93
MW-10	5.91	23.7	6.84	624	1430 - 06/08/93
	3.45	23.3	7.51	629	0800 - 06/09/93
	2.98	23.8	7.85	631	1050 - 06/09/93

^aNTU's - nephelometric turbidity units. ^bμmhos - micromhos.

TABLE B-3

LABORATORY ANALYTICAL METHODS AND SAMPLE VOLUME AND CONTAINER REQUIREMENTS AREA 317 GROUND WATER MONITORING WELLS WHITTAKER CORPORATION, BERMITE DIVISION

Constituent	Analytical Method	Sample Volume (milliliters)	Container Type
Ground Water Monitoring Parameters		50	
pН	EPA 150.1	50	Plastic/glass
Specific Conductance	EPA 120.1	100	Plastic
Total Organic Carbon	EPA 415.1	250	Amber glass-TFE cap
Total Organic Halogen	EPA 9020	250	Amber glass-TFE cap
Trichloroethylene	EPA 601	3 x 40	Amber glass-TFE cap
Sulfate	EPA 300.0	200	Plastic/glass
Sodium	EPA 6010	200	Plastic
Iron	EPA 6010	200	Plastic
Manganese	EPA 6010	200	Plastic
Chloride	EPA 300.0	100	Plastic/glass
Background Water Quality Parameters			
Fluoride	EPA 340.2	100	Plastic/glass
Lead	EPA 7421	100	Plastic
Gross Alpha	EPA 900.0	200	Plastic
Gross Beta	EPA 900.0	200	Plastic
Nitrate	EPA 353.2	200	Plastic
Turbidity	EPA 180.1	250	Amber glass

TABLE B-4

AREA 317 KEY TO ANALYSIS DESIGNATION LABELS ON SAMPLE CONTAINERS BERMITE DIVISION, WHITTAKER CORPORATION

Analysis Designation	Parameter(s) to be Analyzed
A	pH Specific Conductance (temperature corrected)
В	Total Organic Carbon (TOC)
C :	Total Organic Halogen (TOX)
E	Gross alpha, Gross Beta
Н	Sulfate, Chloride
N	Fluoride
o	Trichloroethene (TCE)
R	Sodium, Iron, Manganese
s	Nitrate
Т	Turbidity
v	Lead

Each sample container was labeled with a unique sample number. The form of each label was as follows:

Well I.D./Analysis Designation/Sample Event No.

Where:

Well I.D. = MW-1, MW-3, MW-4, MW-5, MW-6, or MW-10. Analysis Designation = A through O according to above table. Sample Event No. = 1 through present event number.

TABLE B-5 ORDER OF SAMPLE COLLECTION BERMITE DIVISION, WHITTAKER CORPORATION pH, Specific Conductance 1 Total Organic Carbon (TOC) 2 3 Total Organic Halogen (TOX) 4 Gross Alpha, Gross Beta 5 Sulfate, Chloride 6 Fluoride 7 Trichloroethene (TCE) 8 Sodium, Iron, Manganese 9 Nitrate 10 Turbidity 11 Lead



ENVIRONMENTAL SERVICES

36 B. J. Tunnell Blvd. East Miami, Oklahoma 74354-3300 800-331-7425 A Member of the Specially Materials Division, Eagle-Picher Industries, Inc.

Level II Certification

Eagle-Picher level II bottles have been washed in conjunction with the procedures set by the EPA for quality-controlled sample containers.

Wash Procedure A

- Bottles, liners, and caps washed in laboratory-grade, non-phosphate detergent.
- 2. Rinsed three times with distilled water.
- 3. Rinsed with 1:1 nitric acid.
- 4. Rinsed three times with ASTM-Type 1 organic-free water.
- 5. Oven-dried for one hour.
- 6. Rinsed with hexane.
- 7. Oven-dried for one hour.

Verified by:

P. Shuphund

I-CHEM

CERTIFICATE OF ASSURANCE™

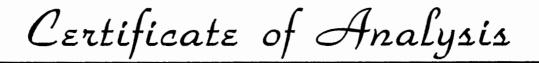
This is your Certificate of Assurance™ for I-CHEM QUALITY-ASSURED™ product which has been prepared in strict accordance with I-CHEM's Total Quality Improvement Process (TQIP). This product has been cleaned, assembled and packaged subject to I-CHEM's on-line quality control procedures. These quality control procedures maintain product conformance to I-CHEM's Performance-Based Specifications for acceptable levels of applicable metals, cyanide, pesticides/PCBs, semi-volatiles and volatiles. Please refer to the case label for the recommended application of this product and applicable lot number.

For a copy of I-CHEM's Performance-Based Specifications or additional information, please contact our Customer Service Department at (800) 443-1689 or (800) 262-5006 inside California.

Randy E. Benson

Corporate Quality Assurance Manager





Bottle Type & QA Level: L Level 1

Description

: 500 mL. White HDPE

Lot No.: L1110010

Date: 4-28-91

METALS QUALITY CONTROL ANALYSIS

This is to certify that this lot was tested and found to comply with Eagle-Picher Environmental Services specifications for this product.

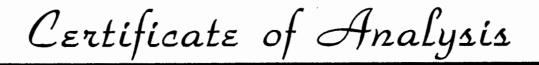
Compound Analyzed	Quantity Found (ug/L)
Silver	<10
Aluminum	<100
Arsenic	
Barium	
Beryllium	
Calcium	<100
Cadmium	
Cobalt	
Chromium	
Copper	
Cyanide	
Iron	
Mercury	
Potassium	
Magnesium	
	,,,,,,,,
Manganese	
Sodium (Polyethylene)	<20
Nickel	
Lead	
Antimony	<5
Selenium	
Thallium	
Vanadium	
Zinc	<20

Approved: Jul Shepherd Date 4-28-91



ENVIRONMENTAL SERVICES

36 B. J. TUNNELL BLVD. EAST • MIAMI, OKLAHOMA 74354-3300 • (800) 331-7425



Bottle Type & QA Level: C Level 1

Description

: 1 Liter White HDPE

Lot No.: C1177010

Date: 7-3-91

METALS QUALITY CONTROL ANALYSIS

This is to certify that this lot was tested and found to comply with Eagle-Picher Environmental Services specifications for this product.

Compound Analyzed Quantity Found (uq/L) Silver...... Arsenic...... Barium.... Calcium.....<100 Cobalt..... Copper..... <10 Cyanide..... Potassium.....<100 Magnesium.....<100 Nickel.... Lead..... Antimony..... <5 Selenium..... <2 Thallium.... <10 Vanadium......

Approved: Les Shephers (13)



ENVIRONMENTAL SERVICES

APPENDIX C CHAIN-OF-CUSTODY FORMS

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APPENDIX D SAMPLE ANALYSES REQUEST FORMS

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APPENDIX E FGL QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) PROGRAM



ANALYTICAL CHEMISTS

Quality Assurance Manual



Corporate Offices & Laboratory P.O. Box 272/853 Corporation Street Santa Paula. CA 93061-0272 TEL: (805) 659-0910 FAX: (805) 525-4172

Office & Laboratory 2500 Stagecoach Road Stockton, CA 95215 TEL: (209) 942-0181 FAX: (209) 942-0423

Field Office Visalia, California TEL: (209) 734-9473 Mobile: (209) 738-6273

ANALYTICAL CHEMISTS

TABLE OF CONTENTS

		Page	No.
I.	Introduction	1	
II.	Organization and Responsibilities	1 -	9
III.	Sample Custody, Tracking, and Sampling Protocol	10 -	29
IV.	Analytical Procedures	30 -	43
٧.	Quality Assurance Objectives	44 -	73
VI.	Internal Quality Control	74 -	89
VII.	Preventative Maintenance	90 -	91
III.	Data Reduction Validation and Reporting	91	
IX.	Corrective Actions	91	
Χ.	Safety	92	

٧

LIST OF TABLES

- Table III-1 Recommended Sample Collection and Preservation
- Table IV-1 Drinking Water Methods
- Table IV-2 Wastewater and Groundwater Methods
- Table IV-3 Hazardous Waste Methods
- Table IV-4 Sludge Methods
- Table V-1 Quality Control Acceptance Criteria for Organic Methods
- Table V-2 Quality Control Acceptance Criteria for Inorganic Chemical Methods
- Table V-3 Quality Control Acceptance Criteria for Radio Chemical Methods
- Table V-4 BFB Key Ion Abundance Criteria
- Table V-5 DFTPP Key Ions and Abundance Criteria
- Table VI-1 Summary of Calibration and Internal Quality Control Procedures for Representative Wet Chemistry Analyses

LIST OF FIGURES

- Figure II-1 Organization Chart
- Figure III-1- Chain of Custody
- Figure VI-1 Example of FGL Control Chart
- Figure VI-2 FGL QC Inspection Report Form
- Figure VI-3 FGL Department of Health Services Certificate

I. Introduction

FGL, Inc. (FGL Environmental) has been serving California industries and governmental agencies on a continually expanding basis since 1925. Office and laboratory facilities are located in both Santa Paula and Stockton. FGL maintains a field office in the Visalia area to serve clients in the central and southern portions of the San Joaquin Valley. A field staff is available in all areas for the collection of samples. Through the use of the most modern instrumentation available and a highly qualified staff, FGL is capable of providing a broad range of organic, inorganic, toxicity, radioactivity and microbiological analyses on waters, wastewaters, soils and hazardous waste materials.

The purpose of this manual is to define and provide instructions for the quality assurance program used by FGL Environmental for its analytical laboratory operations. The objectives of the program are to control, assess, and document the quality of analytical data generated by FGL Environmental. The program achieves these objectives through two functions: (1) providing quality control data that can be used to determine analytical precision and accuracy and (2) controlling data quality within acceptance limits.

This manual identifies laboratory methods published by the U.S. Environmental Protection Agency and other authorities. It describes the quality control procedures to be used with the methods. It describes the overall approach used by FGL Environmental to ensure that the objectives of its QA/QC program are met. If necessary, more detailed procedures can be prepared on a project-specific basis.

II. Organization and Responsibilities

A). Laboratory Personnel Darrell H. Nelson, B.S. John Quinn, Ph.D. Steven D. Castellano, M.S. Dudley S. Jayasinghe, Ph.D. Ricardo Sandoval, B.S. Kurt Wilkinson, B.S. Tiekang Huang, M.S. Thomas Bartanen, M.S. Neil Jessup, B.S. Scott Bucy, B.S. Eric Cotting, M.S. Uday Y. Sathe, M.S. Juan Manuel Magana, B.S. Jeanine Egner, B.S. Santos Marquez, B.A. Michel Franco, B.A. L. Burns

President/Lab Director-Santa Paula Vice President/Lab Director-Stockton Quality Assurance Director-Santa Paula Technical Director/Chemist - Santa Paula Ag Lab Manager - Santa Paula Inorganic Lab Manager-Santa Paula Technical Director - Stockton Quality Assurance Officer - Stockton Agronomist - Visalia Agronomist - Santa Paula Computer Systems Mgr. - Santa Paula Environmental Chemist - Santa Paula

B). Minimum Qualifications:

Title: Chemist - B.S./B.A. degree in chemistry or closely related discipline, i.e. biology, environmental science, etc.

Title: Technician - No degree required. Training for tasks such as sample preparation and routine physical and chemical measurements must have been completed and documented by a qualified chemist. All laboratory work is to be supervised and reviewed by a qualified chemist.

C. Staff Background and Qualifications

Darrell H. Nelson

President/Lab Director-Santa Paula

Education:

B.S. (1970) in Soil and Water Science University of California, Davis.

Qualifications:

Mr. Nelson is the chief executive officer of the corporation, FGL, Inc. His previous experience relating to analytical chemistry includes five years of work as a bench chemist and supervisor of several major projects involving field sampling, laboratory analyses and report

preparation. Mr. Nelson has been employed

by FGL, Inc. since 1970.

John Quinn

Vice President - Lab Director - Stockton

Education:

B.A. (1965) in Chemistry, St. Peter's College

C.Ph.1. (1972) in Organic Chemistry,

U.C.L.A.

Ph.D. (1973) in Organic Chemistry,

U.C.L.A.

Qualifications:

Dr. Quinn is Vice President of the corporation, FGL, Inc. His previous experience includes supervision of major projects in the field of hazardous waste involving laboratory analyses, personnel assignment, client relations and report preparation. Dr. Quinn is currently serving as manager of the Stockton facility

for the corporation.

Steven D. Castellano

Quality Assurance Director - Santa Paula

Education:

B.S. (1987) in Soil Science California Polytechnic State University San Luis Obispo

M.S. (1990) in Soil Chemistry Oregon State University, Corvallis

Qualifications:

Mr. Castellano spent three years as a research assistant at the Soil Science Dept. of Oregon State University. He was in charge of several projects, all involving field sampling, analytical chemistry, computer applications, and

technical report writing.

Dudley S. Jayasinghe

Technical Director - Santa Paula

Education:

Ph.D. in Analytical Chemistry with minor in organic chemistry and physical chemistry Oregon State University, Crovallis B.S. in Organic Chemistry minor in physics University of Peradeniya, Sri Lanka

Qualifications:

Mr. Jayasinghe is presently working as Technical Director at FGL Environmental. He has done post-doctoral research on soil chemistry at the Department of Soil Science at Oregon State University. He has been research assistant in the Department of Chemistry, Oregon State University. He has done research on the absorption transport of organic pollutants in the includes environment. This analytical method development for the trace analysis of organic compounds. He was a teaching assistant in the Department of Chemistry at Oregon State University. He taught undergraduate and graduate courses analytical instrumentation, quantitative chemistry. analysis and general research includes supercritical fluid methods extraction and electrochemical detection of organic compounds. was research officer in the processing division research of the Coconut Research Institute in Sri Lanka. and performed food analysis on products made out of coconut.

Ricardo Sandoval

Ag Lab Manager - Santa Paula

Education:

B.S. (1985) in Crop Science & 2 Year Technical Degree in Fruit Science University of California, San Luis Obispo

Qualifications:

Mr. Sandoval has six years experience using Flame Atomic Absorption, Inductively Coupled Argon Plasma, and Technicon Auto Analyzers for agricultural testing of soil and plant tissue samples.

Kurt Wilkinson

Inorganic Lab Manager - Santa Paula

Education:

B.S. (1987) Biochemistry

California Polytechnic State University

San Luis Obispo

Qualifications:

Mr. Wilkinson has over five years experience including agricultural testing of soil, plant tissue and food products as well as environmental testing of drinking water, wastewater, hazardous waste His most recent experience was airs. managing a trace metals department for an environmental testing facility. Performing personnel assignment and client consultation on analysis needs and data interpretation. He is familiar federal, state, and local inorganic testing

procedures and QA/QC requirements.

Tiekang, Huang

Technical Director - Stockton

Education:

B.S. in Chemistry (1982) M.S. in Chemistry (1987)

M.S. in Environmental Chemistry (1989)

Qualifications:

Mr. Huang has many years of experience in Environmental Analytical Chemistry using Flame AA and Graphite Furnace AA for various metal analyses, GC for volatile organics in water and soil and GC/MS for hazardous organics in wastewater according

to EPA Methods.

Thomas Bartanen

Environmental Chemist

Education:

M.S. in Aquatic Ecology, 1987 University of Nevada, Las Vegas

B.S. Environmental Science, 1980 Bradley University, Peoria, IL

Qualifications:

In addition to his chemistry and chromatographic experience, Mr. Bartanen

has an interdisciplinary background which includes research in limnology and

experience in microbiology and toxicology.

Neil Jessup

Agronomist - San Joaquin Valley

Education:

B.S. (1977) in Agronomy California Polytechnic State University

San Luis Obispo

Qualifications:

Mr. Jessup has experience as a pest control advisor and operations manager for several farm management companies. He also has experience as a field representative for a soil, plant tissue and water laboratory.

James "Scott" Bucy

Agronomist - Santa Paula

Education:

B.S. (1977) in Soil Science

California Polytechnical State University

San Luis Obispo

Qualifications:

Mr. Bucy worked as a landscape contractor for nine years. He has also worked as a licensed agricultural pest control advisor and operator. He has been involved in plant, soil, and pest relationships for over fifteen years.

John Eric Cotting

Environmental Chemist - Santa Paula

Education:

B.S. Chemistry, 1981

University of Alaska, Fairbanks

M.S. Chemistry, 1989

University of Wisconsin, Madison

Qualifications:

Mr. Cotting's undergraduate and graduate research experience is in the areas of physical chemistry involving both macro and small molecules. Previous work experience in hazardous condition for the was University of Alaska Fire Department and general laboratory skills and instrumental methods developed during his education training.

Uday Y. Sathe

Chemist

Education:

M.Sc. (1983) in Chemistry University of Bombay, India M.S. (1988) in Chemistry Mississippi State University

Qualifications:

Research for masters thesis involved separation and identification of compounds like Benzene, Toluene, Chlorbenzene, Allyl Benzene, Chlorotoluene, Napthalene and Biphenyl resulting from vacuum pyrolysis of Allyl Chloride using GC and GC/FTIR.

Also used FTIR and Raman spectrometers for vibrational analysis of some bicycloheptanes.

Also taught general chemistry and senior level physical chemistry labs.

Research involved use of Nicolet 7199
Fourier Transform infared spectrometer with a liquid nitrogen cooled mercury-cadmium telluride (MCT) detector combined with a Nicolet 1280 computer.

Perkin Elmer Model 283 B grating spectrophotometer.

SPEX Ramalog DUV Spectrometer equipped to use the 488-nm line of spectraphysics Model 171 argon ion laser as the exitation source, to obtain the Raman spectra.

Varian 3700 gas chromatograph equipped with flame ionization detector (FID).

Varian-3700 gas chromatograph connected to the gold-coated, glass lightpipe equipped with KBR windows was used for GC/FTIR.

Mr. Sathe has been employed by FGL, Inc. since 1988.

Juan Manuel Magana

Chemist

Education:

B.S. (1987) in Soil Science University of Culiacan, Mexico

Qualification:

Mr. Magana is currently doing organic extractions for the corporation, FGL Environmental. His previous experience is as an assistant in a research project doing soil microbiology for six months.

Jeanine G. Egner:

Environmental Chemist - Santa Paula

Education:

B.S. (1987) in Environmental

Systematic Biology

California Polytechnic State University

San Luis Obispo

Qualifications:

Ms. Egner is an Environmental Chemist responsible for a variety of organic and inorganic analyses in soil, water, and sludge. She also performs environmental assessments, field sampling, and hazardous waste site characterizations. She has over four years experience working in water quality control for government agencies and conducting environmental surveys in the environmental consulting industry.

Santos Marquez

Biologist - Santa Paula

Education:

B.A. in Biological Sciences, 1990 University of California, Santa Barbara

Oualifications:

Mr. Marquez has experience in laboratory work through courses at UC Santa Barbara.

Michel Franco

Environmental Chemist - Santa Paula

Education:

B.A. in Chemistry, 1990

California State University, Northridge

Oualifications:

Ms. Franco worked on the analysis of calcium in serum, using the A.A. at a major medical laboratory. She helped organize the specimen processing lab for greater efficiency. Was used as a liaison between lab sections for sample testing.

Developed fool proof procedure for an Instrumental Analysis Class at CSUN. The analysis of trace zinc in water with a complexing reagent utilizing the A.A.

L. Burns

Chemist

Education:

B.S. (1986) in Zoology, University of Idaho, Moscow

Qualifications:

Instrumentation experience including the operation and maintenance of seven different models of Finnigan GC/MS systems, and the Hewlett Packard 5970 MSD.

Group leader experience including the development and implementing of quality control parameters, tracking of analyses through the laboratory to ensure technical compliance with established criteria. Scheduling and training of GC/MS chemists.

GC/MS analytical experience including analysis of soils, liquids, and hazardous wastes for volatiles and semivolatiles for the EPA contract laboratory program and for private industry.

Air toxics GC/MS chemist experience including the analysis of ambient air and source emissions by tedlar bag, summa canistor, carbon molecular sieve, tenax sorbent traps, and charcoal. These methods were achieved with the use of thermal desorption and/or cryogenic preconcentration techniques.

ORGANIZATION CHART FGL, INC.

<u>President</u> Darrell H. Nelson

Vice President John Quinn

	Santa Paula						Stockto	on
	Laboratory Director Darrell H. Nelson	<u>Technical Dir</u> Dudley Jayas			Quality Assurance Steve Castel		<u>Laboratory (</u> John Qui	
			<u>Santa</u>	Paula Laboratory				
Organic Lab Lab Manager Dudley Jayasingh	Inorganic Lab Lab Manager ne Kurt Wilkinson	Agricultural Lab Lab Manager Ricardo Sandoval	Radioactivity Lab Manager Steve Castellano	<u>Bacteriologist</u> Raquel Harvey	Accounting	Office	<u>Field Ser</u>	rvices
<u>Chemists</u> Uday Sathe Juan Magana	<u>Chemists</u> Santos Marquez Jeanine Egner		<u>Chemists</u> Michel Franco		<u>Bookkeeper</u> Beverly Baca	Office Manager Kristie Marlow	Agronomist Scott Bucy	<u>Agronomist</u> Neil Jessup
L. Burns			<u>Sam</u> Ma	Santa Paula <u>ple Custodians</u> ria Hernandez rtha Hamblin		<u>Field Supt.</u> George Trouw		
				r Systems Manager ric Cotting				
		Technicians Joan McKinney Daniel Reyna		•		Customer Services Cindy Aguirre Martha Hamblin Maria Hernandez Tiffany Douglas	<u>Technicians</u> Pete Munoz	
			Stock	ton Laboratory				
				<u>ratory Manager</u> ohn Quinn				
Organic Lab	Inorganic Lab	Bacteriologist Tinni Kar		<u>le Custodian</u> ia De La Cruz		Office	Field Service	<u>es</u>
<u>Chemist</u> Tom Bartanen	<u>Chemist</u> Tiekang Huang					Office Manager Joanna Culham	<u>Technician</u> Mark Brock	
						<u>Customer Service</u> Linda Quinn Amelia De La Cruz		

III. Sample Custody, Tracking, and Sampling Protocol

A). Sample Custody

It is essential to ensure sample integrity from collection to data reporting. This includes the ability to trace possession and handling of the sample from the time of collection through analysis and final disposition. This is referred to as chain-of-custody and is important in the event of litigation involving the results. Where litigation is not involved, chain-of-custody procedures are useful for routine control of sample flow.

A sample is considered to be under a person's custody if it is in the individual's physical possession, in the individual's sight, secured in a tamper-proof way by that individual, or is secured in an area restricted to authorized personnel. The following procedures summarize the major aspects of chain-of-custody. More detailed discussions are available.

1). <u>Sample Labels</u>: Use labels to prevent sample misidentification. Gummed paper labels or tags generally are adequate. Include at least the following information: Sample number, name of collector, date and time of collection, and place of collection.

Affix labels to sample containers before or at the time of sampling. Fill label out with waterproof ink at time of collection.

2). Sample Seals: Use sample seals to detect unauthorized tampering with samples up to the time of analysis. Use gummed paper seals that include, at least, the following information: Sample number (identical with number on sample label), collector's name, and date and time of sampling. Plastic shrink seals also may be used.

Attach seal in such a way that it is necessary to break it to open the sample container. Affix seal to container before sample leaves custody of sampling personnel.

3). Field Log Book: Record all information pertinent to a field survey or sampling in a bound log book. As a minimum, include the following in the log book; purpose of sampling; location of sampling point; name and address of field contact; producer of material being sampled and address, if different from location; and type of sample. If sample is wastewater, identify process producing waste stream. Also provide suspected sample composition, including concentrations; number and volume of sample taken; description of sampling point and sampling method; date and time of collection; collector's sample identification number(s); sample distribution transported; references such as maps or photographs of the sampling site; field observations and measurements; signatures of personnel responsible for observations. Because sampling situations vary widely no general rule can be given as to the information to be entered in the log book. It is desirable to record sufficient information so that one could reconstruct the sampling without reliance on the collector's memory. Protect the log book and keep it in safe place.

- 4). Chain-of-Custody Record: Fill out a chain-of-custody record to accompany each sample or group of samples. The record includes the following information: sample number; signature of collector; date, time, and address of collection; sample type; signatures of persons involved in the chain of possession; and inclusive dates of possession.
- 5). <u>Sample Delivery to Laboratory</u>: Deliver sample to laboratory as soon as practicable. Accompany sample with chain-of-custody record and a sample analysis request sheet. Deliver sample to sample custodian.
- 6). Receipt and Logging of Sample: In the laboratory, the sample custodian receives the sample and inspects its condition and seal, reconciles label information and seal against the chain-of-custody record, assigns a laboratory number, logs sample in the laboratory computer, and stores it in a secured storage room or cabinet until it is assigned to an analyst.
- 7). Assignment of Sample for Analysis: The laboratory supervisor usually assigns the sample for analysis. Once in the laboratory, the supervisor or analyst is responsible for the sample's care and custody.
- 8). Safety Considerations: Because sample constituents can be toxic, take adequate precautions during sampling and sample handling. Toxic substances can enter through the skin and, in the case of vapors, through the lungs. Inadvertent ingestion can occur via direct contact with foods or by adsorption of vapors onto foods. Precautions may be limited to wearing gloves or may include coveralls, aprons, or other protective apparel. Always wear eye protection. When toxic vapors might be present, sample only in well-ventilated areas or use a respirator or self-contained breathing apparatus. In a laboratory, open sample containers in a fume hood. Never have food near samples or sampling locations; always wash hands thoroughly before handling food.

If flammable organic compounds may be present, take adequate precautions. Prohibit smoking near samples, sampling locations, and in the laboratory. Keep sparks, flames, and excessive heat sources away from samples, and sampling locations. Avoid buildup of flammable vapors in a refrigerator storing samples because electrical arcing at contacts of thermostat, the door-activated light switch, or other electrical components may trigger a fire or explosion. If flammable compounds are suspected or known to be present and samples are to be refrigerated, use only specially designed explosion-proof refrigerators.

When in doubt as to the level of safety precautions needed, consult an appropriately trained industrial hygienist. Samples with radioactive contaminants require other safety considerations; consult a health physicist.

B). Laboratory Sample Control and Tracking

FGL's sample control objectives are achieved through the use of the in-house Laboratory Information Management System (LIMS). LIMS is a computer software system specifically designed by FGL for tracking and handling of the large amount of information required to efficiently manage an analytical chemistry laboratory. The system provides a versatile, easy-to-use vehicle for the laboratory managers to obtain the information needed to make scheduling and priority decisions.

C). FGL Sampling Protocol

1). Water Samples: The result of any analytical determination can be no better than the sample on which it is performed. It is not practical to specify detailed procedures for the collection of all samples here because of varied purposes and analytical procedures. More detailed information appears in connection with specific methods. This section presents general considerations, applicable primarily to chemical analyses.

The objective of sampling is to collect a portion of material small enough in volume to be transported conveniently and handled in the laboratory while still accurately representing the material being sampled. This objective implies that the relative proportions or concentrations of all pertinent components will be the same in the samples as in the material being sampled, and that the sample will be handled in such a way that no significant changes in composition occur before the tests are made.

A sample may be presented to the laboratory for specific determinations with the collector taking responsibility for its validity. Often, in water and wastewater work, the laboratory conducts or prescribes the sampling program, which is determined in consultation with the user of the test results. Such consultation is essential to insure selecting samples and analytical methods that provide a true basis for answering the questions that prompted the sampling.

a). General Precautions: Obtain a sample that meets the requirements of the sampling program and handle it in such a way that it does not deteriorate or become contaminated before it reaches the laboratory. Before filling, rinse sample bottle two or three times with the water being collected, unless the bottle contains a preservative or dechlorinating agent. Depending on determinations to be performed, fill container full (most organics determinations) or leave space for aeration, mixing, etc. (microbiological analyses). For samples that will be shipped, preferably leave an air space of about one (1) percent of container capacity to allow for thermal expansion.

Special precautions are necessary for samples containing organic compounds and trace metals. Because many constituents may be present at concentrations of micrograms per liter, they may be totally or partially lost if proper sampling and preservation procedures are not followed.

Representative samples of some sources can be obtained only by making composites of samples collected over a period of time or at many different sampling points. The details of collection vary so much with local conditions that no specific recommendations would be universally applicable.

Sometimes it is more informative to analyze numerous separate samples instead of one composite so as not to obscure maxima and minima.

Sample carefully to insure that analytical results represent the actual sample composition. Important factors affecting results are the presence of suspended matter or turbidity, the method chosen for its removal, and the physical and chemical changes brought about by storage or aeration. Particular care is required when processing (grinding, blending, sieving, filtering) samples to be analyzed for trace constituents, especially metals and organic compounds. Some determinations, particularly of lead, can be invalidated by contamination from such processing. Treat each sample individually with regard to the substances to be determined, the amount and nature of turbidity present, and other conditions that may influence the results.

It is impractical to give directions covering all conditions, and the choice of technique for collecting a homogeneous sample must be left to the analyst's judgment. In general, separate any significant amount of suspended matter by decantation, centrifugation, or an appropriate filtration procedure. Often a slight turbidity can be tolerated if experience shows that it will cause no interference in gravimetric or volumetric tests and that its influence can be corrected in colorimetric tests, where it has potentially the greatest interfering effect. When relevant, state whether or not the sample has been filtered. To measure the total amount of a constituent, do not remove suspended solids, but treat them appropriately.

Make a record of every sample collected and identify every bottle, preferably by attaching an appropriately inscribed tag or label. Record sufficient information to provide positive sample identification at a later date, including the name of the sample collector, the date, hour, and exact location, the water temperature, and any other data that may be needed for correlation, such as weather conditions, water level, stream flow, post-sampling handling, etc. Provide space on the label for the initials of those assuming sample custody and for the time and date of transfer. Fix sampling points by detailed description, by maps, or with the aid of stakes, buoys, or landmarks in a manner that will permit their identification by other persons without reliance on memory or personal guidance. Particularly when sample results are expected to be involved in litigation, use formal "chain-of-custody" procedures which trace sample history from collection to final reporting.

Cool hot samples collected under pressure while they are still under pressure.

Before collecting samples from distribution systems, flush lines sufficiently to insure that the sample is representative of the supply, taking into account the diameter and length of the pipe to be flushed and the velocity of flow.

Collect samples from wells only after the well has been pumped sufficiently to insure that the sample represents the groundwater source. Sometimes it will be necessary to pump at a specified rate to achieve a characteristic drawdown, if this determines the zones from which the well is supplied. Record pumping rate and drawdown.

When samples are collected from a river or stream, observed results may vary with depth, stream flow, and distance from shore and from one shore to the other. If equipment is available, take an "integrated" sample from top to bottom in the middle of the stream or from side to side at mid-depth.

Lakes and reservoirs are subject to considerable variations from normal causes such as seasonal stratification, rainfall, runoff, and wind. Choose location, depth, and frequency of sampling depending on local conditions and the purpose of the investigation. Avoid surface scum.

For certain constituents, sampling location is extremely important. Avoid areas of excessive turbulence because of potential loss of volatile constituents and of potential presence of toxic vapors. Avoid sampling at weirs because such locations tend to favor retrieval of lighter-than-water, immiscible compounds. Generally, collect samples beneath the surface in quiescent areas. If composite samples are required, take care that sample constituents are not lost during compositing because of improper handling of portions being pooled. For example, casual dumping together of portions rather than addition to the composite through a submerged siphon can cause unnecessary volatilization.

Use only representative samples (or those conforming to a sampling program) for examination. The great variety of conditions under which collections must be made makes it impossible to prescribe a fixed procedure. In general, take into account the tests or analyses to be made and the purpose for which the results are needed.

b). Types of Samples

1). Grab or Catch Samples: Strictly speaking, a sample collected at a particular time and place can represent only the composition of the source at that time and place. However, when a source is known to be fairly constant in composition over a considerable period of time or over substantial distances in all directions, then the sample may be said to represent a longer time period or a larger volume, or both, than the specific point at which it was collected. In such circumstances, some sources may be represented quite well by single grab samples.

Examples are some water supplies, some surface waters, and rarely, some wastewater streams. When a source is known to vary with time, grab samples collected at suitable intervals and analyzed separately can document the extent, frequency, and duration of these variations. Choose sampling intervals on the basis of the frequency with which changes may be expected, which may vary from as little as five (5) minutes to as long as one (1) hour or more. Seasonal variations in natural systems may necessitate sampling over months. When the source composition varies in space rather than time, collect samples from appropriate locations.

Use great care in sampling wastewater sludges, sludge banks, and muds. No definite procedure can be given, but take every possible precaution to obtain a representative sample or one conforming to a sampling program.

Composite Samples: In most cases, the term "composite 2). sample" refers to a mixture of grab samples collected at the same sampling point at different times. Sometimes the term "time-composite" is used to distinguish this type of sample from others. Time-composite samples are most useful for observing average concentrations that will be used, for example, in calculating the loading or the As an efficiency of a wastewater treatment plant. alternative to the separate analysis of a large number of samples, followed by computation of average and total results, composite samples represent a substantial saving in laboratory effort and expense. For these purposes, a composite sample representing a 24 hour period is considered standard for most determinations. certain circumstances, however, a composite sample representing one shift, or a shorter time period, or a complete cycle of a periodic operation, may be preferable. To evaluate the effects of special, variable, or irregular discharges and operations, collect composite samples representing the period during which such discharges occur.

For determining components or characteristics subject to significant and unavoidable changes on storage, do not use composite samples. Make such determinations on individual samples as soon as possible after collection and preferably at the sampling point. Analyses for all dissolved gases, residual chlorine, soluble sulfide, temperature, and pH are examples of this type of determination. Changes in such components as dissolved oxygen or carbon dioxide, pH, or temperature may produce secondary changes in certain inorganic constituents such as iron, manganese, alkalinity, or hardness. Use time-composite samples only for determining components that can be demonstrated to remain unchanged under the conditions of sample collection and preservation.

Take individual portions in a wide-mouth bottle having a diameter of at least 35 mm at the mouth and a capacity of at least 120 mL. Collect these portions every hour - in some cases every half hour or even every five (5) minutes - and mix at the end of the sampling period or combine in a single bottle as collected. If preservatives are used, add them to the sample bottle initially so that all portions of the composite are preserved as soon as collected. Analysis of individual samples sometimes may be necessary. It is desirable, and often essential, to combine individual samples in volumes proportional to flow. A final sample volume of 2 to 3 L is sufficient for sewage, effluents, and wastes.

Automatic sampling devices are available; however, do not use them unless the sample is preserved as described below. Clean sampling devices, including bottles, daily to eliminate biological growths and other deposits.

Integrated Samples: For certain purposes, the information needed is provided best by analyzing mixtures of grab samples collected from different points simultaneously, or as nearly so as possible. Such mixtures sometimes are called integrated samples. An example of the need for such sampling occurs in a river or stream that varies in composition across its width and depth. To evaluate average composition or total loading, use a mixture of samples representing various points in the cross-section, in proportion to their relative flows. The need for integrated samples also may exist if combined treatment is proposed for several separate wastewater streams, the interation of which may have a significant effect on treatability or even on composition. Mathematical prediction of the interactions may be inaccurate or impossible and testing a suitable integrated sample may provide more useful information.

Both natural and artificial lakes show variations of composition with both depth and horizontal location. However, under many conditions, neither total nor average results are especially significant; local variations are more important. In such cases, examine samples separately rather than integrate them.

Preparation of integrated samples usually requires special equipment to collect a sample from a known depth without contaminating it with overlying water. Knowledge of the volume, movement, and composition of the various parts of the water being sampled usually is required. Therefore, collecting integrated samples is a complicated and specialized process that cannot be described in detail.

2). Hazardous Waste Samples

a). Volatile Organics: Standard 40 mL glass screw-cap VOA vials with Teflon-faced silicone septum may be used for both liquid and solid matrices. The vials and septum should be soap and water washed and rinsed with distilled deionized water. After thoroughly cleaning the vials and septum, they should be placed in a muffle furnace and dried at 150 C for approximately one hour. (Note: Do not heat the septum for extended periods of time, i.e., more than one hour, because the silicone begins to slowly degrade at 105 C).

When collecting the samples, liquids and solids should be introduced into the vials gently to reduce agitation which might drive off volatile compounds. Liquid samples should be poured into the vial without introducing any air bubbles within the vial as it is being filled. Should bubbling occur as a result of violent pouring, the sample must be poured out and the vial refilled. Each VOA vial should be filled until there is a meniscus over the lip of the vial. The screw-top lid with the septum (Teflon side toward the sample) should then be tightened onto the vial. After tightening the lid, the vial should be inverted and tapped to check for air bubbles. If there are any air bubbles present the sample must be retaken. Two VOA vials should be filled per sample location.

VOA vials for samples with solid or semi-solid (sludges) matrices should be completely filled as best as possible. The vials should be tapped slightly as they are filled to try and eliminate as much free air space as possible. Two vials should also be filled per sample location.

VOA vials should be filled and labeled immediately at the point at which the sample is collected. They should NOT be filled near a running motor or any type of exhaust system because discharged fumes and vapors may contaminate the samples. The two vials from each sampling location should then be sealed in separate plastic bags to prevent cross-contamination between samples particularly if the sampled waste is suspected of containing high levels of volatile organics. (Activated carbon may also be included in the bags to prevent cross-contamination from highly contaminated samples). VOA samples may also be contaminated by diffusion of volatile organics through the septum during shipment and storage. To monitor possible contamination, a trip blank prepared from distilled deionized water should be carried throughout the sampling, storage, and shipping process.

- <u>Semivolatile Organics</u>: (This includes Pesticides and b). Herbicides) Containers used to collect samples for the determination of semivolatile organic compounds should be soap and water washed followed by methanol (or isopropanol) rinsing. The sample containers should be of glass or Teflon and have screw-top covers with Teflon liners. In situations where Teflon is not available, samples may react with the aluminum foil, causing eventual contamination of the sample. Plastic containers or lids may <u>NOT</u> be used for the storage of samples due to the possibility of sample contamination from the phthalate esters and other hydrocarbons within the plastic. Sample containers should be filled with care so as to prevent any portion of the collected sample coming in contact with the sampler's gloves, thus causing contamination. Samples should not be collected or stored in the presence of exhaust fumes. If the sample comes in contact with the sampler (e.g., if an automatic sampler is used), run reagent water through the sampler and use as a field blank.
- c). <u>Trace Metals</u>: In the determination of trace metals, containers can introduce either positive or negative errors in the measurement of trace metals by (a) contributing contaminants through leaching or surface desorption, and (b) depleting concentrations through adsorption. Thus the collection and treatment of the sample prior to analysis require particular attention.

3). Underground Storage Tank Samples

a). <u>Field Notebook</u>: The field investigator should keep a field notebook (preferably bound with pages numbered) to record sample collection procedures, dates, laboratory identification, sample collection location, and the name of the sampler. This is important for later recall or legal challenge.

b). Soil Samples

Hydrocarbons: Soil samples collected from a backhoe, the 1). ground or a soil coring device, should be collected in a thin-walled stainless steel or brass cylinder at least three inches long by one inch in diameter that has been prepared by the laboratory doing the analysis or the project consultant (cylinders can be made to fit inside the preferred split-barrel core sampler). About one inch of soil should be removed from the immediate surface area where the sample is to be taken and the cylinder then pounded into the soil with a wooden mallet. No headspace should be present in the cylinder once the sample is collected. When the sample is collected, each end of the cylinder should be covered with aluminum foil and then capped with a polyethylene lid, taped, and labeled. The sample should then be immediately placed in an ice chest containing dry ice and kept frozen for delivery to the laboratory. Care should be taken throughout to avoid contamination of both the inside and outside of the cylinder and its contents.

Samples should be kept frozen at the laboratory until they are analyzed. Holding time should not exceed 14 days from the time of collection. Frozen soil cores should be removed from the cylinders by spot heating the cylinder and immediately extruding the sample (or a portion of it). A portion of the frozen sample should be removed and prepared for analysis according to approved EPA methods.

In situations where the above procedure is inappropriate, i.e. semi-solid samples, glass vials (properly prepared by contract laboratory consultant) with Teflon seal and screw cap should be used, and maintained at 4 C until analysis.

- 2). Organic Lead: Tetraethyl/tetramethyl-lead are volatile; therefore, soil samples should be collected in cylinders and frozen as described for volatile hydrocarbons above.
- 3). <u>Shipping Samples</u>: Where commercial shippers are involved, dry ice may present Department of Transportation (DOT) shipping problems and "blue ice" may have to be substituted.

4). Water Samples

Free Floating Product (from a well): Sampling of free floating product on the surface of ground water should not be performed until the well has been allowed to stabilize for at least 24 hours after development or other withdrawal procedure. A sample should be collected that is indicative of the thickness of floating product within the monitoring well. This may be accomplished by the use of a clear, acrylic bailer designed to collect a liquid sample where free product and ground water meet. A graduated scale on the bailer is helpful for determining the thickness of free product. Samples should be field-inspected for the presence of odor and/or sheen in addition to the above evaluation.

Electronic measuring devices also are available for determining the thickness of the hydrocarbon layer floating on ground water.

5). Dissolved Product (from a well): If free product is detected, analysis of water for dissolved product should be conducted after the free product has been substantially removed from the well. Before collecting a water sample, a well should be purged until temperature, conductivity and pH stabilize. Often, this will require removal of four or more well volumes by bailing or pumping. Once well volumes are removed and well water is stabilized, a sample can be taken after the water level approaches 80 percent of its initial level. Where water level recovery is slow, the sample can be collected after stabilization is achieved.

Ground water samples should be collected in a manner which reduces or eliminates the possibility of loss of volatile constituents from the sample. For collecting samples, a gas-actuated positive displacement pump or a submersible pump is preferred. A Teflon or stainless steel bailer is acceptable. Peristaltic pumps or airlift pumps should not be used.

Cross-contamination from transferring pumps (or bailers) from well to well can occur and should be avoided by thorough cleaning between sampling episodes. Dedicated (i.e., permanent installation) well pumps, while expensive, are often cost effective in the long term and ensure data reliability relative to cross-contamination. If transfer of equipment is necessary, sampling should proceed from the least contaminated to the most contaminated well, if the latter information is available before sample collection.

Water samples should be collected in vials or containers specifically designed to prevent loss of volatile constituents from the sample. These vials should be provided by an preferably, analytical laboratory laboratory, and the conducting the analysis. No headspace should be present in the sample container once the container has been capped. This can be checked by inverting the bottle, once the sample is collected, and looking for bubbles. Sometimes it is not possible to collect a sample without air bubbles, particularly if water is aerated. In these cases, the investigator should record the problem and account for probable error. Cooling samples may also produce headspace (bubbles), but these will disappear once the sample is warmed for analysis.

Samples should be placed in an ice chest maintained at 4 C with blue ice (care should be taken to prevent freezing of the water and bursting of the glass vial). A thermometer with a protected bulb should be carried in each ice chest.

6). <u>Surface Water</u>: Grab samples should be collected in appropriate glass containers supplied by the laboratory. The sample should be collected in such a manner that air bubbles are not entrapped. Semisolid samples should be collected the same way. The collected samples should be refrigerated (blue ice, 4 C) for transport and analyzed within seven (7) days of collection (14 days with preservatives).

4). Pesticide Residue Sampling Procedures

- a). Samples Regarding Re-entry/Worker Safety: All samples should be from the plant foliage (leaf tissue) when pesticides are applied to the foliage. Sometimes areas other than the plant foliage may be in question, such as the dripline area surface soil and/or the leaf duff (leaf litter) under the trees. The sample should be large enough to fill a normal "lunch bag" and be taken from several plantings.
- b). <u>Samples Regarding Consumer Safety</u>: The edible portion of the plant or fruit should be collected. The sample should contain approximately one (1) pound of material taken from several plants. Usually six to eight whole plants or fruit pieces will make up a good sample.

D). Sample Handling Policy

1). Sample Handling Instructions

- a). Sample Container & Volume The use of proper sample containers holding an appropriate volume of sample is essential to FGL Environmental's quality assurance program. The Recommended Sample Collection and Preservation shows the type of containers and the volume required for each analysis.
- b). Sample Preservation The proper preservation of samples is a fundamental element of FGL Environmental's quality assurance program. The Recommended Sample Collection and Preservation shows the preservation measures required for each analysis. FGL Environmental's staff follows methods listed in the Handbook for Sampling and Sample Preservation of Water and Wastewater. U.S. EPA Monitoring and Support Laboratory; Cincinnati, Ohio; September 1982.
- c). Sample Holding Times Strict observance of the holding time requirement for each type of analyses is essential to FGL Environmental's quality assurance program. The Recommended Sample Collection and Preservation shows the maximum allowable holding times for each analysis.

The information given in The Recommended Sample Collection and Preservation is based on recommendations in $\underline{\text{EPA}}$ Methods for Chemical Analysis of Water and Wastewater (EPA-600/4-79-020) and $\underline{\text{EPA}}$ Test Methods for Evaluating Solid Waste (SW-846).

2). Sample Receiving Policy

a). Obtain the following client information and place on customer lab ticket:

Billing Name:		
Address:		
Phone Number:		
Person to Contact:		
Report Form Required: State	FGL	
Is Chain of Custody requiredYes	!	No

- b). Determine the analyses needed and indicate on customer lab ticket:
 - 1). Use EPA Method Number or list elements
 - 2). Determine if preservatives have been added
- c). Determine turn-around-time requirement: _____Rush Non-Rush Indicate on the customer lab ticket and the laboratory work sheet if a rush is required. The red colored rush stamp is to be used for this purpose.

- d). Inspect the sample for the following:
 - Have holding times been observed and determine if it is possible for FGL to meet holding times? (See attached holding time requirements)
 - 2). Is the sample size adequate?
 - 3). Is the sample container satisfactory? (See attached sample container requirements)
 - 4). Note sample condition

Broken/leaking o	container						
Custody Seal	Intact	Broken					
Temperature	Ambient	Chilled					
Record Actual Temperature							
Check for headsp	pace when appropr	iate					

Make note of any problems with sample condition on the customers lab ticket, the person notified, time and date notified, and customers response, if any.

Check all samples for radioactivity analyses and hazardous waste evaluation for radio chemical hazard using the Model 3 Survey Meter kept in the log-in room. If the sample is found to have a reading of 0.3 mrads/hour or greater; then, the sample must be refused.

- e). Log the sample information into the laboratory computer under one of the following categories: Inorganic Drinking and Wastewater Lab Samples, Organic Lab Samples, Radioactivity Lab Samples, and Ag Lab Samples.
- f). Transfer samples and analyses instructions (lab work sheets) to the appropriate refrigerator or lab work distribution area. See the attached sheet titled "Sample Storage and Distribution Policy".



FRUIT GROWERS LABORATORY, INC.

CHAIN-OF-CUSTODY

FIGURE III-1

Phone: Fax: Project Contact Sampler Comp san Time: Purchase QA/QC re Lab numl	name: person: (s): mpler setup:Date: Mileage: e order number: eport required: Yes ber: Location/Description	/ Time:_	Time	Type of Sample: Composite(C) Grab (G)	nber of Containers	Type of Containers: (B) Rrass (V) VOA (G) Glass (P) Plastic	(S) Soil (SL)Sludge (O) Oil	(SW) Surface Water (MW) Monitoring Well (GW) Ground Water (TB) Travel Blank (MW) Wastewater (S) Spike (DW) Drinking Water	(P) Potable (NP) None Potable	Preservative:NaHSO4, HCL, H2SO4, HNO3, pH <2 NaOH pH>9 or pH>12 ; Na2S2O3 if chlorinated Other								Sample Condition: Temperature (L) Leaking, (B) Broken (HS) VOA Headspace	Custody Seal (Y) (N)
Sample Number		Sampled	Sampled	Ty	Nu	Ty (8)	(S)	\$ 5 5 B	1)	4 C								श्रे⊒≝	Ğ
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Meth. of	f disp.: Date o	f ret.:/	''													 			

TABLE III-1 Recommended Sample Collection and Preservation

Analysis	Container	Volume (mL)	Preservation	Holding Time
General Inorganic Che	emistry			
Acidity Alkalinity Ammonia Bicarbonate Biochemical Oxygen	P,G P,G P,G P	250 250 250 250 1000	Cool, 4 C Cool, 4 C H2SO4, pH <2; Cool, 4 C Cool, 4 C Cool, 4 C	14 days 14 days 28 days 14 days 48 hours
Demand Boron Carbonate Carbon Dioxide Chemical Oxygen Demand	P P P,G P,G	100 250 250 100	Cool, 4 C Cool, 4 C Cool, 4 C H2SO4, pH <2; Cool, 4 C	28 days 14 days Analyze immed. 28 days
Chloride Chlorine Residual Chlorine Demand Color Cyanide, Total Electrical	P,G P,G P,G P,G P	100 500 2000 100 1000	Cool, 4 C Cool, 4 C Cool, 4 C Cool, 4 C NaOH, pH >12; Cool, 4 C Cool, 4 C	7 days 2 hours 2 hours 48 hours 14 days 28 days
Conductivity Fluoride Hardness, Total Hydroxide Langelier Index MBAS	P,G P,G P P,G P,G	100 100 250 500 500	Cool, 4 C HNO3, pH <2; Cool, 4 C Cool, 4 C Cool, 4 C Cool, 4 C	7 days 6 months 14 days 2 hours 24 hours
Nitrogen, Ammonia Nitrate	P,G P,G	100 100	H2SO4, pH <2; Cool, 4 C H2SO4, pH <2; Cool, 4 C w/o preservation	28 days 28 days 48 hours
Nitrite Organic Total Total Kjeldahl Odor Oil and Grease Oxygen, Dissolved	P,G P,G P,G G G W/glass	100 400 100 200 500 1000 300 stopper	Cool, 4 C H2SO4, pH <2; Cool, 4 C H2SO4, pH <2; Cool, 4 C H2SO4, pH <2; Cool, 4 C Cool, 4 C H2SO4, pH <2; Cool, 4 C Cool, 4 C Cool, 4 C	48 hours 28 days 28 days 28 days 48 hours 28 days Analyze immed.
pH Phenolics Phosphorus	P,G G, amber	50	Cool, 4 C H2SO4, pH <2; Cool, 4 C	2 hours 28 days
Ortho or Dissolved Total Resistivity Silica Sodium Percent Sodium Absorption Ratio	P,G P,G P P P	100 50 100 50 200 200	Cool, 4 C H2SO4, pH <2; Cool, 4 C Cool, 4 C Cool, 4 C Cool, 4 C Cool, 4 C	48 hours 28 days 28 days 28 days 6 months 6 months

P = plastic, G = glass
All solid samples should be kept cool at 4 C
-24-

TABLE III-1 (cont'd.)

Recommended Sample Co	ollection and	l Preservation Volume	on	Holding
Analysis	Container	(mL)	Preservation	Time
General Inorganic Che	emistry conti	nued		
Solids, Filterable Non-filterable Total Volatile Settleable Sulfate Sulfide Total Dissolved Tannin & Lignin Titration - pH adjustment Turbidity	P,G P,G P,G P,G P,G P,G P,G	100 100 100 100 1000 200 600 500 250 250	Cool, 4 C 2 ml ZnC2H3O2 plus NaOH to pH >9 Cool, 4 C Cool, 4 C Cool, 4 C	7 days 7 days 7 days 7 days 48 hours 28 days 7 days 24 hours 14 days 48 hours
Trace Metals		·		
Chromium VI Mercury All other metals	P,G P,G P	500 200 200	Cool, 4 C HNO3, pH <2 HNO3, pH <2	24 hours 28 days 6 months
Radio Chemical				
Gross Alpha & Beta* Total Radium Total Uranium Radon Tritium Strontium 90	P P P G 2 G	1000 1000 1000 × 250 250 1000	HN03, pH <2 HN03, pH <2 HC1, pH <2 Cool, 4 C Cool, 4 C HC1, pH <2	6 months 28 days 6 months 36 hours N/A 6 months

^{*} For non-preserved samples, the holding time is 5 days. For preserved samples, please provide either a non-preserved sample (100 mL) or the E.C. (obtained prior to acidification).

Bacteriological

Coliform-Fecal & P,G 100 0.008% Na2S203; 30 hours Total Cool, 4 C

Note: All solid samples should be collected in stainless steel sleeves, brass sleeves or in amber glass jars all with teflon-lined caps and 100-250g capacity. All solid samples should be kept cool at 4 C.

P = plastic, G = glass

TABLE III-1 (cont'd.)

Recommended Sample Collection and Preservation

Analysis	Container	Volume (mL)	Preservation	Holding Time
Organic Chemicals*				
Drinking Water				
Title 22 Organics (EPA 505 & 515)	Amber glass TFE-lined cap	2 x 125 1 x 1000	Na2S2O3, if chlorinated Cool, 4 C	7 days**
EPA 501	Glass (VOA) TFE-septa cap	2 x 40	Na2S2O3, if chlorinated HCl or NaHSO4 pH <2 Cool, 4 C	14 days
EPA 502.2	Glass (VOA) TFE-septa cap	2 x 40	Na2S2O3, if chlorinated HCl pH <2; Cool, 4 C	14 days
EPA 504	Glass TFE-septa cap	2 x 125	Cool, 4 C	28 days
EPA 505	Glass TFE-septa cap	2 x 125	Na2S2O3, if chlorinated Cool, 4 C	7 days**
EPA 507	Amber glass TFE-lined cap	1 x 1000	Na2S2O3, if chlorinated or HCl pH <2; Cool, 4 C	14 days
EPA 508	Amber glass TFE-lined cap	1 x 1000	Cool, 4 C	7 days**
EPA 515	Amber glass TFE-lined cap	1 x 1000	Cool, 4 C	7 days**
EPA 515.1	Amber glass TFE-lined cap	1 x 1000	Cool, 4 C	7 days**
EPA 524.2	Glass (VOA) TFE-septa cap	2 x 40	Na2S2O3, if chlorinated or HCl pH <2; Cool, 4 C	14 days
EPA 525	Amber glass TFE-lined cap	2 x 1000	Cool, 4 C	7 days**
EPA 531	Amber glass	250	Na2S2O3, if chlorinated Monochloroacetic acid, (suggested) pH=3	14 days
EPA 547	Amber glass	125	Na2S2O3, if chlorinated Cool, 4 C	14 days

<sup>No head space over sample.
** This is the maximum holding time prior to extraction. The extracted sample may be held up to 40 days before analysis.</sup>

TABLE III-1 (cont'd.)

Recommended Sample Collection and Preservation

Analysis	Container	Volume (mL)	Preservation	Holding Time
Organic Chemicals*	,			
Wastewater and Haz	ardous Waste			
EPA 601/8010	Glass (VOA) TFE-septa cap	2 x 40	Na2S2O3, if chlorinated HCl or NaHSO4, pH <2 Cool, 4 C	14 days
EPA 602/8020	Glass (VOA) TFE-septa cap	2 x 40	Na2S2O3, if chlorinated HCl or NaHSO4, pH <2 Cool, 4 C	14 days
EPA 603/8030	Glass (VOA) TFE-septa cap	2 x 40	Na2S2O3, if chlorinated Adjust pH to 4-5 Cool, 4 C	14 days
EPA 604/8040	Amber glass TFE-lined cap	1 x 1000	Na2S2O3, if chlorinated Cool, 4 C	7 days**
EPA 608/8080	Amber glass TFE-lined cap	1 x 1000	Na2S2O3, if chlorinated Cool, 4 C	7 days**
EPA 614/8140	Amber glass TFE-lined cap	1 x 1000	Cool, 4 C	7 days**
EPA 615/8150	Amber glass TFE-lined cap	1 x 1000	Na2S2O3, if chlorinated Cool, 4 C	7 days**
EPA 619	Amber glass TFE-lined cap	1 x 1000	Cool, 4 C	14 days
EPA 624/8240	Glass (VOA) TFE-septa cap	2 x 40	Na2S2O3, if chlorinated HCl, pH <2; Cool, 4 C	14 days
EPA 625/8270	Amber glass TFE-lined cap	1 x 1000	Na2S2O3, if chlorinated Cool, 4 C	7 days**
EPA 9020 (TOX)	Amber glass TFE-lined cap	250	H2SO4, pH <2 Cool, 4 C	14 days* 7 days***

Note: All solid samples should be collected in stainless steel sleeves, brass sleeves or in amber glass jars all with teflon-lined caps and 100-250g capacity. All solid samples should be kept cool at 4 C.

^{*} No head space over sample.

^{**} This is the maximum holding time prior to extraction. The extracted sample may be held up to 40 days before analysis.

^{***} RCRA holding time is 7 days.

TABLE III-1 (cont'd.)

Recommended Sample Collection and Preservation

Analysis	Container	Volume (mL)	Preservation	Holding Time
Organic Chemicals	•			
Wastewaters and Ha	azardous Waste			
EPA 415.1 (TOC)	Amber glass TFE-lined cap	250	HC1 or H2SO4, pH <2 Cool, 4 C	28 days
EPA 9060	See solids note	250 g	Cool, 4 C	N/A
DBCP and/or EDB	Amber glass TFE-lined cap	2 x 125	Na2S2O3, if chlorinated HC1 pH <2, Cool, 4 C	7 days**
TCE and/or PCE	Amber glass TFE-lined cap	2 x 125	Na2S2O3, if chlorinated HC1 pH <2, Cool, 4 C	7 days**
Underground Storag	ge Tank Analyses*			
EPA 8015, 8015M, 418.1	Glass (VOA) TFE-septa cap	2 x 40	HC1, pH <2 Cool, 4 C	14 days
EPA 602/8020	Glass (VOA) TFE-septa cap	2 x 40	HCl or NaHSO4, pH <2 Cool, 4 C	14 days
EPA 8010	Glass (VOA) TFE-septa cap	2 x 40	HCl or NaHSO4, pH <2 Cool, 4 C	14 days
EPA 7421/7420 (Total Lead)	Plastic/Glass	200	HNO3, pH <2 Cool, 4 C	6 months
EPA 7420 (Soluble Lead)	Plastic/Glass	200	Cool, 4 C	14 days

Note: All solid samples should be collected in stainless steel sleeves, brass sleeves or in amber glass jars all with teflon-lined caps and 100-250g capacity. All solid samples should be kept cool at 4 C.

^{*} No head space over sample.

^{**} This is the maximum holding time prior to extraction. The extracted sample may be held up to 40 days before analysis.

TABLE III-1 (cont'd.)

Recommended Sample Collection and Preservation

Analysis	Container	Volume (mL)	Preservation	Holding Time
Hazardous Waste Charac	terization			
Corrosivity	Glass/plastic	100	Cool, 4 C	7 days
Ignitability	Glass TFE-lined cap	100	Cool, 4 C	7 days
Reactivity				
Reactions	Glass TFE-lined cap	100	Cool, 4 C	7 days
Sulfide/Cyanide generation	Glass TFE-lined cap	100	Cool, 4 C	7 days
TCLP and EP Toxicity				
Metals	Glass TFE-lined cap	500	Cool, 4 C	30 days
Pesticides	Amber glass TFE-lined cap	1000	Cool, 4 C	7 days**
Herbicides	Amber glass TFE-lined cap	1000	Cool, 4 C	7 days**
Bioassays				
Toxicity Bioassay	Glass/plastic	30 L	Cool, 4 C	24 hours
Calif. Acute Toxicity	Glass/plastic	25 L	Cool, 4 C	24 hours
Definitive	Glass/plastic	60 L	Cool, 4 C	24 hours

Note: All solid samples should be collected in stainless steel sleeves, brass sleeves or in amber glass jars all with teflon-lined caps and 100-250g capacity. All solid samples should be kept cool at 4 C.

^{**} This is the maximum holding time prior to extraction. The extracted sample may be held up to 14 days before analysis.

IV. Analytical Procedures

A). Method Sources

The analytical methods used by FGL are primarily those published by the U.S. Environmental Protection Agency. Some methods are from Standard Methods for the Examination of Water and Waste Water, 17th Edition, APHA-AWWA-WPCF, 1989. Other methods are used, when applicable, according to project specific requirements.

FGL uses methods found in the following EPA Manuals:

Procedures Manual for Ground water Monitoring at Solid waste disposal Facilities, EPA SW-600.

EPA Test methods for Evaluating Solid Waste, EPA SW-846.

EPA Methods of Chemical Analysis in Waters and Wastewaters (MCAWW) EPA-600/4-79-020)

Prescribed Procedures for Measurement of Radioactivity in Drinking Water (EPA-600/4-80-032)

B). Specific Methods Used

The analytical methods performed at FGL fall into four general categories: Drinking water methods, waste water and groundwater methods, hazardous waste methods, and sludge methods. These methods are listed in Tables IV-1 through IV-4.

Table IV-1

DRINKING WATER METHODS

Parameter	Method	Description
Organic Chemicals		
Chlorinated Pesticides & Herbicides Alachlor, Aldrin, Chlordane, Dieldrin, Endrin, Heptachlor, Heptachlor epoxide, Hexachlorobenzene, Lindane, Methoxychlor, PCB's, Toxaphene, Bentazon, 2,4-D, 2,4,5-TP (Silvex)	EPA 505 & 515.1 (Title 22)	GC/ECD, micro extraction/ liquid-liquid extraction
Trihalomethanes Volatile Organics Trichloroethylene (TCE) Tetrachloroethylene (PCE) TCE & PCE Dibromochloropropane (DBCP) Ethylene dibromide (EDB) EDB & DBCP Chlorinated Pesticides Alachlor, Aldrin, Chlordane, Dieldrin, Endrin, Heptachlor, Heptachlor epoxide, Hexachlorobenzene, Lindane, Methoxychlor, PCB's, Toxaphene	EPA 501 EPA 502.2 EPA 502.2/524.2} EPA 502.2/524.2} EPA 502.2/524.2} EPA 504 EPA 504 EPA 504 EPA 504	GC/ECD, micro extraction GC/PID/Hall, purge & trap GC/PID/Hall, purge & trap or GC/MS, purge & trap GC/ECD, micro extraction
Nitrogen/phosphorus Pesticides Atrazine, Bromacil, Diazinon, Dimethoate Molinate, Prometryn, Simazine, Thiobencarb	EPA 507	GC/NPD, liquid-liquid extraction
Chlorothalonil	EPA 508	GC/ECD, liquid-liquid extraction
Herbicides Bentazon, 2,4-D, 2,4,5-TP (Silvex)	EPA 515.1	u
Volatile Organics Diethylhexylphthalate	EPA 524.2 EPA 525	GC/MS, purge & trap GC/MS, liquid-liquid extraction
Carbamates Aldicarb Sulfone, Aldicarb Sulfoxide, Oxamyl, Methomyl, 3-Hydroxycarbofuran, Aldicarb, Propoxur, Carbofuran, Carbaryl, 1-Naphthol, Methiocarb	EPA 531	HPLC, post column derivatization
Glyphosate (Roundup)	EPA 547	HPLC, post column derivatization
Bacteriological Analyses		
Total Coliform - 5 tube procedure Total Coliform - 10 tube procedure Total & Fecal Coliform - 5 tube procedure Total & Fecal Coliform - 10 tube procedure	SM 908A SM 908A SM 908C SM 908C	Fermentation, MPN
Standard Plate Count Total Coliform-Colilert (24 hour turn-around)	SM 908A MMO-MUG	Incubation, visual count Fermentation, MPN

Table IV-1

DRINKING WATER METHODS (cont'd.)

Parameter		Method	Description
General Inorganic Chemistry			
Acidity		EPA 305.1	Titration
Acidity Alkalinity	(CaCO3)	EPA 310.1	Titration
Ammonia	(NH3)	2177 01011	
By colorimetric		EPA 350.1	Colorimetric
By distillation (low le	evel)	EPA 350.2	Dist./Colorimetric
Bicarbonate	(HCO3)	EPA 310.1	Colorimetric
Biochemical Oxygen Demand	` <i>-</i>	EPA 405.1	ISE
Bromide	(Br)	SM 405	Colorimetric
Carbonate	(CO3)	EPA 310.1	Titration
Carbon Dioxide	(CO2)	SM 406	Titration
Chemical Oxygen Demand	(COD)	EPA 410.2	Colorimetric
Chloride	(C1)	EPA 325.3	Titration
Chlorine Residual	(C12)	SM 407C	Titration
Chlorine Demand		SM 409A	Titration
Color	(0)1)	EPA 110.3	Visual
Cyanide, Total	(CN)	EPA 335.2	Colorimetric
Electrical Conductivity	(EC)	EPA 120.1	Conductivity Bridge
Fluoride	(F)	EPA 340.2	ISE
By electrode By distillation		EPA 340.2	Distillation/ISE
Hardness, total	(CaCO3)	EPA 130.2	Titration
Hydroxide	(OH)	EPA 310.1	Titration
Langelier Index (corrosiv		SM 203	
(langelier index calc.		Calc.	
MBAS	···· 3 /	EPA 425.1	Colorimetric
Nitrogen			
Ammonia	(NH3)	EPA 350.1	Colorimetric
Nitrate	(NO3)	EPA 353.2	Colorimetric
Nitrite	(NO2)	EPA 353.2	Colorimetric
Organic	(TKN - NH3)	Calc.	
Total	(TKN + NO3 + NO2)	Calc.	
Total Kjeldahl Nitroge	n	EPA 351.2	Colorimetric
Odor		EPA 140.1	Cusuimatuis
Oil and Grease	(00)	EPA 413.1 EPA 360.1	Gravimetric ISE
Oxygen, Dissolved Phenols	(DO)	EPA 420.1	Colorimetric
Phosphorus		LFA 420.1	COTO! IMECT IC
Ortho	(PO4-P)	EPA 365.2	Colorimetric
Dissolved-ortho	(PO4-P)	EPA 365.2	Colorimetric
Total	(P)	EPA 365.4	Colorimetric
Total-dissolved	(P)	EPA 365.4	Colorimetric
рН	` '	EPA 150.1	ISE
Resistivity			
Sodium Percent		Calc.	
Sodium Absorption Ratio	(SAR)	EPA 200.7	ICP
(SAR calculation only)		Calc.	

Table IV-1

DRINKING WATER METHODS (cont'd.)

Parameter		Method	Description				
General Inorganic Chemistry continued							
Solids/Residue Filterable Non-filterable Total Volatile Settleable Sulfate	(TDS) (Suspended)	EPA 160.1 EPA 160.2 EPA 160.3 EPA 160.4 EPA 160.5 EPA 375.4	Gravimetric Gravimetric Gravimetric Gravimetric Gravimetric Turbidimetric				
Sulfide (H2S) Total Dissolved Tannin & Lignin Titration - pH adjustment Turbidity		EPA 376.1 EPA 376.1 SM 513 Calc. EPA 180.1	Methylene Blue Methylene Blue Colorimetric Nephelometric				
Trace Metals							
Aluminum (Al) Antimony (Sb) Arsenic (As) Barium (Ba) Beryllium (Be) Boron (B) Cadmium (Cd) Calcium (Ca) Chromium (Cr) Cobalt (Co) Copper (Cu) Iron (Fe) Lead (Pb) Lithium (Mg)		EPA 202.2 EPA 204.2 EPA 206.2 EPA 200.7 EPA 200.7 EPA 213.2 EPA 200.7 EPA 218.2 EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 EPA 239.2 SM 303A EPA 200.7	Flame/Furnace Atomic Absorption ICP ICP ICP ICP ICP Flame/Furnace Atomic Absorption ICP Flame/Furnace Atomic Absorption ICP				
Manganese (Mn) Mercury (Hg) Molybdenum (Mo) Nickel (Ni) Potassium (K) Selenium (Se)		EPA 200.7 EPA 245.1 EPA 200.7 EPA 249.1 EPA 200.7 EPA 270.2	ICP Flame/Furnace Atomic Absorption ICP Flame/Furnace Atomic Absorption ICP Flame/Furnace Atomic Absorption				
Silica (SiO2) Silver (Ag) Sodium (Na) Thallium (T1) Tin (Sn) Vanadium (V) Zinc (Zn)		EPA 200.7 EPA 272.2 EPA 200.7 EPA 279.2 EPA 282.2 EPA 200.7 EPA 200.7	ICP Flame/Furnace Atomic Absorption ICP Flame/Furnace Atomic Absorption ICP ICP ICP				

Table IV-1

DRINKING WATER METHODS (cont'd.)

Parameter	Method	Description
Radio Chemical Analyses		
Gross Alpha	EPA 900.0	Proportional Counter
Gross Beta	EPA 900.0	. 11
Gross Alpha & Beta	EPA 900.0	10
Total Radium*	EPA 900.1	Isolation, Proportional Counter
Uranium	EPA 908.0	Distillation, Liquid Scintillation
Tritium	EPA 906.0	Distillation, Liquid Scintillation
Radon	EPA 913.0	Liquid Scintillation

 $[\]star$ Can be reported as Radium 226 if less than 3 pCi/liter.

Table IV-2

WASTEWATER AND GROUNDWATER METHODS

Parameter	Method	Description
Priority Pollutant Analyses		
Chlorinated Pesticides & PCB's GC/MS Method for Volatile Organics GC/MS Base/Neutral & Acids	EPA 608/8080 EPA 624/8240 EPA 625/8270	GC/ECD,liquid-liquid or Soxhlet extr. GC/MS,purge & trap GC/MS,liquid-liquid or Soxhlet extr.
Metals		
Sample preparation Antimony, Arsenic, Beryllium, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Silver, Thallium & Zinc	EPA 3020 EPA 6010/ 7000's	Digest ICP Flame/Furnace Atompic Absorption
Cyanide Phenols	EPA 335.2 EPA 420.1	Colorimetric Colorimetric
Organic Chemical Analyses		
Purgeable Halocarbons Non-Halogenated Volatile Organics Aromatic Volatile Organics Purgeable Halocarbons & Aromatic Volatile Organics Phenols Chlorinated Pesticides & PCB's Chlorinated Pesticides PCB's Polynuclear Aromatic Hydrocarbons Organophosphorus Pesticides Chlorinated Herbicides Triazine Pesticides GC/MS Method for Volatile Organics GC/MS Base/Neutral & Acids Base/Neutral fraction Acid fraction Carbamates Total Organic Halogens (TOX) Total Organic Carbon (TOC) Trichloroethylene (TCE) Tetrachloroethylene (PCE) TCE & PCE		GC/PID/Hall, purge & trap GC/PID/Hall, purge & trap GC/PID/Hall, purge & trap GC/PID,purge & trap GC/ECD liquid-liquid or Soxhlet extr. " GC/FPD liquid-liquid or Soxhlet extr. GC/ECD liquid-liquid or Soxhlet extr. GC/NPD liquid-liquid GC/MS purge & trap GC/MS liquid-liquid or Soxhlet extr. " HPLC/UV liquid-liquid Coulometric, Pyrolysis Combustion, IR *GC/PID/Hall purge & trap *GC/MS purge & trap *GC/MS purge & trap

Table IV-2

WASTEWATER AND GROUNDWATER METHODS (cont'd.)

Parameter	Method	Description
Bacteriological Analyses		
Total Coliform -	SM 908A	Fermentation, MPN
15 tube procedure Total & Fecal Coliform -	SM 908C	Fermentation, MPN
15 tube procedu r e Standard Plate Count	SM 907A	Incubation, visual count
Radio Chemical Analyses		
Gross Alpha Gross Beta Gross Alpha & Beta Total Radium* Uranium Tritium Radon	EPA 900.0 EPA 900.0 EPA 900.1 EPA 908.0 EPA 906.0 EPA 913.0	Proportional counter Proportional counter Proportional counter Isolation, proportional counter Isolation, proportional counter Distillation, liquid scintillation Liquid scintillation

^{*} Can be reported as Radium 226 if less than 3 pCi/liter.

Table IV-2

WASTEWATER AND GROUNDWATER METHODS (cont'd.)

Parameter		Method	Description
General Inorganic Chemistry			
Acidity		EPA 305.1	Titration
Alkalinity	(CaCO3)	EPA 310.1	Titration
Ammonia	(NH3)	2177 01011	1101201011
By colorimetric	()	EPA 350.1	Colorimetric
By distillation (low le	evel)	EPA 350.2	Dist./Colorimetric
Bicarbonate	(HC03)	EPA 310.1	Colorimetric
Biochemical Oxygen Demand	·	EPA 405.1	ISE
Bromide Strong S	(Br)	SM 405	Colorimetric
Carbonate	(CO3)	EPA 310.1	Titration
Carbon Dioxide	(CO2)	SM 406	Titration
Chemical Oxygen Demand	(COD)	EPA 410.2	Colorimetric
Chloride	(C1)	EPA 325.3	Titration
Chlorine Residual	(C12)	SM 407C	Titration
Chlorine Demand	(0.2)	SM 409A	Titration
Color		EPA 110.3	Visual
Cyanide, Total	(CN)	EPA 335.2	Colorimetric
Electrical Conductivity	(EC)	EPA 120.1	Conductivity Bridge
Fluoride	(F)	LIN ILV.I	conductivity by rage
By electrode	(1)	EPA 340.2	ISE
By distillation		EPA 340.1	Distillation/ISE
Hardness, total	(CaCO3)	EPA 130.2	Titration
Hydroxide	(OH)	EPA 310.1	Titration
Langelier Index (corrosiv	` '	SM 203	1101401011
(langelier index calc.		Calc.	
MBAS	only)	EPA 425.1	Colorimetric
Nitrogen		2177 12011	5515. Time 51. Te
Ammonia	(NH3)	EPA 350.1	Colorimetric
Nitrate	(NO3)	EPA 353.2	Colorimetric
Nitrite	(NO2)	EPA 353.2	Colorimetric
Organic	(TKN - NH3)	Calc.	COTOT TIME CT TC
	(TKN + NO3 + NO2)		
Total Kjeldahl Nitroger		EPA 351.2	Colorimetric
Odor	•	EPA 140.1	oo for time or re
Oil and Grease		EPA 413.1	Gravimetric
Oxygen, Dissolved	(DO)	EPA 360.1	ISE
Phenols	(55)	EPA 420.1	Colorimetric
Phosphorus			
Ortho	(PO4-P)	EPA 365.2	Colorimetric
Dissolved-ortho	(PO4-P)	EPA 365.2	Colorimetric
Total	(P)	EPA 365.4	Colorimetric
Total-dissolved	(P)	EPA 365.4	Colorimetric
pH	· /	EPA 150.1	ISE
Resistivity			
Sodium Percent		Calc.	
Sodium Absorption Ratio	(SAR)	EPA 200.7	ICP
(SAR calculation only)	(=)	Calc.	

Table IV-2

WASTEWATER AND GROUNDWATER METHODS (cont'd.)

Parameter			Me	thod	Description
General Inorganic	Chemistry cont	inued			
Solids/Residu	e				
Filterable		S)		160.1	Gravimetri c
Non-filter	able (Sus	spended)		160.2	Gravimetric
Total				160.3	Gravimetric
Volatile				160.4	Gravimetric
Settleable				160.5	Gravimetric
Sulfate	(\$04		EPA	375.4	Turbidimetric
Sulfide	(H2S	S)			
Total				376.1	Methylene Blue
Dissolved				376.1	Methylene Blue
Tannin & Lign				513	Colorimetric
Titration - p	H adjustment		Cal		Marchada anatasta
Turbidity			EPA	180.1	Nephelometric
Trace Metals					
Sample prepar	ation for metals	s analysis	EPA	3005/30	020 Digestion
Aluminum	(A1)			7020	Flame/Furnace Atomic Absorption
Antimony	(Sb)			7041	u .
Arsenic	(As)			7060	u .
Barium	(Ba)			6010	ICP
Beryllium	(Be)			6010	"
Boron	(B)			6010	"
Cadmium	(Cd)			7131	Flame/Furnace Atomic Absorption
Calcium	(Ca)			6010	ICP
Chromium	(Cr)			7191	Flame/Furnace Atomic Absorption
	Cr+6)			7196	
Cobalt	(Co)			6010	ICP
Copper	(Cu)			6010	"
Gold	(Au)			231.1	Flame/Furnace Atomic Absorption
Iron	(Fe)			6010	ICP
Lead	(Pb)			7421	Flame/Furnace Atomic Absorption
Lithium	(Li)		SM	7430	
Magnesium	(Mg)			7450 7460	
Manganese Mercury	(Mn)			7470	Cald Vapan Atomic Abcountion
Molybdenum	(Hg) (Mo)			6010	Cold Vapor Atomic Absorption ICP
Nickel	(Ni)			7520	Flame/Furnace Atomic Absorption
Potassium	(K)			7610	"
Selenium	(Se)			7741	II .
Silica	(Si02)			6010	ICP
Silver	(Ag)			7761	Flame/Furnace Atomic Absorption
Sodium	(Na)			7770	H Tame, Tarinace Acomire Absorption
Thallium	(T1)			7841	W .
Tin	(Sn)			7870	n
Vanadium	(V)			6010	ICP
Zinc	(Zn)			6010	ICP
	\·/	-38-			

Table IV-3

HAZARDOUS WASTE METHODS

Parameter .	Method	Description
California Assessment Manual (CAM-TTLC)	Title 22	
Metals analyses		
Sample preparation Sb,As,Se Ba,Be,Cd,Cr,Co,Cu,Pb,Mo,Ni,Ag,Tl,V,Zn Hg	EPA 3050 EPA 7000's EPA 6010/ 7000's EPA 7470	Digestion Flame/Furnace Atomic Absorption ICP Flame/Furnace Atomic Absorption Cold Vapor Atomic Absorption
Chromium VI (Cr+6)	EPA 7196	Colorimetric
Fluoride (distillation)	EPA 340.1	Distillation, ISE
Organic analyses		
2,4-D & 2,4,5-TP (Silvex) PCP TCE Aldrin, BHC, Chlordane, DDD, DDE, DDT, Dieldrin, Endrin, Endosulfan, Heptachlo Lindane, Methoxychlor, PCB's, Toxaphene		GC/ECE, Soxhlet Extraction GC/PID/Hall, purge & trap GC/ECD, Soxhlet Extraction
Waste Extraction Test (WET-STLC)	Title 22	
Sample Preparation (citrate buffer extract	tion)	
Metals analyses		
<pre>Sb,As,Se Ba,Be,Cd,Cr,Co,Cu,Pb,Mo,Ni,Ag,Tl,V,Zn Hg</pre>	EPA 7000's EPA 6010/ 7000's EPA 7471	Flame/Furnace Atomic Absorption ICP Flame/Furnace Atomic Absorption
Chromium VI (Cr+6)	EPA 7196	Colorimetric
Fluoride (distillation)	EPA 340.1	Distillation/ISE
Organic analyses		
2,4-D & 2,4,5-TP (Silvex) PCP TCE Aldrin, BHC, Chlordane, DDD, DDE, DDT, Dieldrin, Endrin, Endosulfan, Heptachlo Lindane, Methoxychlor, PCB, Toxaphene	EPA 8150 EPA 8150 EPA 8010 EPA 8080	GC/ECE, Soxhlet Extraction GC/PID/Hall, purge & trap 's GC/ECD, Soxhlet Extraction

Table IV-3

HAZARDOUS WASTE METHODS (cont'd.)

Parameter	Method	Description
TCLP (Toxicity Characteristic Leaching Procedure)	RCRA	
Extraction		
ZHE (Zero Headspace Extraction) TCLP Extraction for all non-volatiles	EPA 1311	
Metals		
Sample preparation Arsenic, Barium, Cadmium, Chromium, Lead Mercury, Selenium & Silver	EPA 3020 EPA 6010/ 7000's	Digestion ICP Flame/Furnace Atomic Absorption
Organic Analyses		
Volatiles from ZHE Base-Neutral & Acids Herbicides Pesticides	EPA 8240 EPA 8270 EPA 8150 EPA 8080	GC/MS, purge & trap GC/MS, Soxhlet Extraction GC/ECD, Soxhlet Extraction GC/ECD, Soxhlet Extraction
EP Toxicity	RCRA	
Extraction	EPA 1310	
Metals .		
Arsenic, Barium, Cadmium, Chromium, Lead Mercury, Selenium & Silver	EPA 6010/ 7000's	ICP Flame/Furnace Atomic Absorption
Organic Analyses		
Herbicides Pesticides	EPA 8150 EPA 8080	GC/ECD, Soxhlet Extraction GC/ECD, Soxhlet Extraction
ICAP Scan		
Aluminum, Antimony, Arsenic, Boron, Cadmium, Barium, Beryllium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Potassium, Selenium, Sodium, Thallium, Vanadium, Zinc	EPA 6010/ 7000's	ICP Flame/Furnace Atomic Absorption

Table IV-3

HAZARDOUS WASTE METHODS (cont'd.)

Parameter		Method	Description
Underground Storage Tank Analys	is		
Total Petroleum Hydrocarbons Total Petroleum Hydrocarbons		EPA 8015M EPA 418.1	GC/FID, purge & trap IR, liquid-liquid
(I.R. Spectroscopy) Benzene, Toluene, Fibulhonzone, Yulone	(BTEX)	EPA 8020	GC/PID, purge & trap
Ethylbenzene, Xylene TPH and BTEX		EPA 8015M/ 8020	GC/FID, purge & trap
Ethylene Dibromide and Ethylene Dichloride	(EDB) (EDC)	EPA 8010	GC/PID/Hall, purge & trap
Total Lead Soluble Lead		EPA 7420 EPA 7420	Flame/Furnace Atomic Absorption Flame/Furnace Atomic Absorption
Organic Chemical Analysis			
Purgeable Halocarbons Non-Halogenated Volatile Organ	ics	EPA 8010 EPA 8015 M EPA 8020	GC/PID/Hall, purge & trap GC/FID purge & trap
Aromatic Volatile Organics Purgeable Halocarbons & Aromatic Volatile Organics		EPA 8010 & 8020	GC/PID/Hall, purge & trap GC/PID, purge & trap
Phenols Chlorinated Pesticides & PCB's		EPA 8040 EPA 8080	GC/ECD, liquid-liquid GC/ECD, liquid-liquid or Soxhlet extr.
Chlorinated Pesticides PCB's Polynuclear Aromatic Hydrocarb	ons	EPA 8080 EPA 8080 EPA 8100	" " " Soxifiet extr.
Organophosphorus Pesticides Chlorinated Phenoxy Herbicides		EPA 8140 EPA 8150	GC/FPD, liquid-liquid or Soxhlet extr. GC/ECE, liquid-liquid or Soxhlet extr.
Triazine Pesticides GC/MS Method for Volatile Orga		EPA 619 EPA 8240	GC/NPD, liquid-liquid
GC/MS Base/Neutral & Acids Base/Neutral fraction		EPA 8270 EPA 8270	GC/MS, liquid-liquid or Soxhlet extr.
Acid fraction Carbamates		EPA 8270 EPA 632	" HPLC/UV, liquid-liquid
Total Organic Halogens (TOX) Total Organic Carbon (TOC)		EPA 9020 EPA 9060	Coulometric, Pyrolysis Combustion, IR
Total Organic Carbon (TOC) Trichloroethylene (TCE)			GC/MS, purge & trap
Tetrachloroethylene (PCE) TCE & PCE		EPA 8010/8240 EPA 8010/8240	

Table IV-3

HAZARDOUS WASTE METHODS (cont'd.)

Parameter	Method	Description
Hazardous Waste Characterization Corrosivity	RCRA/Title 22	
Aqueous sample (pH) Nonaqueous sample (1:1 DI water pH)	EPA 9040 EPA 9045	ISE ISE
Ignitability		
Aqueous (Flashpoint) Nonaqueous (Flammability)	EPA 1010 EPA 1020	Flashpoint Flashpoint
Reactivity		Observation
Reaction with water Reaction with dilute acid Reaction with dilute base Reaction with oxidizing agent Reaction with reducing agent Sulfide generation Cyanide generation		

Toxicity Bioassay

Title 22

Calif. Acute Toxicity - 96 Hr. % Survival

Screen - 2 conc. + control - 20 fish/conc. Definitive - 5 conc. + control - 20 fish/conc.

Table IV-4

SLUDGE METHODS

Parameter		Method	Description
General Inorganic Chemist	ry		
Cyanide, total Fluoride Moisture Nitrogen	(CN) (F)	EPA 335.2 EPA 340.1 ASA/UL	·
Ammonia Nitrate Total	(NH3) (NO3) (TKN+NO3+NO2)	EPA 350.1 EPA 353.2 EPA 351.1	Colorimetric
Oil and grease Separatory funnel Soxhlet pH		EPA 413.1 EPA 413.2 EPA 9045	IR ISE
Phosphorus, Total Sulfide	(P) (H2S)	EPA 365.4 EPA 376.1	Colorimetric Colorimetric
Trace Metals			
Sample preparation for Aluminum (Al) Antimony (Sb) Arsenic (As) Barium (Ba) Beryllium (Be)	r metals analysis	EPA 3050 EPA 6010 EPA 7041 EPA 7060 EPA 6010	Digestion ICP Furnace/Flame Atomic Absorptic Furnace/Flame Atomic Absorptic ICP

V. Quality Assurance Objectives

The quality assurance plan for laboratory operations has two main objectives. Primarily, it supplies a mechanism for continual control and assessment of data quality. Secondly, historical quality control data may be used to define data quality in terms of accuracy and precision.

The quality control objectives for accuracy, precision, and Method Detection Limit (MDL) are listed in Tables V-1 to V-3. Accuracy values are expressed as a percentage of a true value, and serve as a reflection of the total measurement error (random and systematic). Accuracy is usually measured by determination of the percent recovery of known target analyte addition to a given sample or representative sample matrix.

Precision values are expressed as relative percent difference (RPD) between two duplicate measurements, and serve as a reflection of the variability in measurement replication.

The Method Detection Limit (MDL) reflects the minimum concentration of a given analyte in a given matrix that can be determined and reported with 99 percent confidence that the analyte concentration is above zero. Detection limit studies are conducted annually to ensure that the objectives listed in this section are met or exceeded.

Table V-4 and V-5 list key ions and ion abundance for the calibration criteria compounds (BFB and DFTPP, respectively) used in GC-MASS Spectrometry methods.

FGL uses the following equations for quality control calculations:

% Recovery =
$$\frac{Actual\ Value}{Theoretical\ Value}$$
 X 100

The relative percent difference (RPD) in duplicate samples is calculated by:

$$RPD = \frac{(Value(1) - Value(2)) \times 100\%}{(Value(1) + Value(2))/2}$$

and sample standard deviation (when applicable) may be calculated by:

$$\begin{array}{c|c}
i = n \\
\leq \\
i = 1 \\
\hline
n - 1
\end{array}$$

Where: $X_i = \text{The i}^{\text{th}}$ sample observation

 \overline{X} = The sample average

n = The total number of sample observations

For general mineral analysis, the anion and cation balances should be determined. If the difference is more than 0.3 meq/L or 5 percent (whichever is greater), the analysis should be rechecked.

For GC/MS analyses, the overall precision and accuracy of recovery is monitored by the addition of internal standards to every sample.

FGL Analytical Review Policy

Chemists/analysts will review each others data on an ongoing basis and note the review of data by dating and initialling the work or section reviewed in the analyst's notebook. This internal checking of data by the chemist will be confirmed by the QA/QC Director. All work completed by a technician is checked by the technician's supervisor before publishing.

Analytical results are recorded in the FGL Laboratory Information Management System (LIMS) to show the date on which the data was obtained and the analyst responsible for the data. Precision and accuracy (duplicates and spikes) data is also recorded by the analyst into the FGL LIMS system. The acceptance limits are stored in the LIMS system as well. The LIMS system required that the data meet the acceptance criteria and be checked by a second analyst prior to release for reporting. If matrix interference is the cause for data being out of acceptance limits, the LIMS system will also require that a supervisor release the data with a comment explaining the reason for the out of control data. System security is achieved by the use of personalized passwords and restricted electronic access according to personal responsibilities.

QUALITY CONTROL ACCEPTANCE CRITERIA for ORGANIC METHODS

Method EPA 501

CONSTITUENT	ACCURACY % RECOVERED	PRECISION RPD	MDL
Bromodichloromethane Bromoform Chloroform Dibromochlormethane	70-130 70-130 70-130 70-130	20.0 20.0 20.0 20.0	0.050 ug/L 0.050 ug/L 0.050 ug/L 0.050 ug/L
Method EPA 502.2			
CONSTITUENT	ACCURACY % RECOVERED	PRECISION RPD	MDL
Benzene Bromobenzene Bromochloromethane Bromodichloromethane Bromoform Bromomethane n-Butylbenzene sec-Butylbenzene tert-Butylbenzene Carbon Tetrachloride Chlorobenzene Chlorotoluene Chlorotoluene Chlorotoluene 4-Chlorotoluene DBCP Dibromochlormethane 1,2-Dibromoethane Dibromomethane 1,2-Dichlorobenzene 1,3-Dichlorobenzene 1,4-Dichlorobenzene 1,4-Dichloroethane 1,1-Dichloroethane 1,1-Dichloroethylene cis-1,2-Dichloroethylene trans-1,2-Dichloroethylene 1,2-Dichloropropane 1,3-Dichloropropane 1,3-Dichloropropane 1,3-Dichloropropene cis-1,3-Dichloropropene cis-1,3-Dichloropropene	37-151 50-150 50-150 35-155 45-169 D-242 50-150 50-150 50-150 70-140 37-160 14-230 51-138 D-273 50-150	30.0 30.0	0.050 ug/L

-46-

QUALITY CONTROL ACCEPTANCE CRITERIA for ORGANIC METHODS

Method	EPA	502	. 2
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CONSTITUENT	ACCURACY % RECOVERED	PRECISION RPD	MDL
Hexachlorobutadiene Isopropylbenzene p-Isopropyltoluene Methylene Chloride Naphthalene n-Propylbenzene Styrene 1,1,2-Tetrachlorethane 1,1,2,2-Tetrachloroethane Tetrachloroethylene Toluene 1,2,3-Trichlorobenzene 1,1,1-Trichlorobenzene 1,1,2-Trichloroethane Trichlorethylene Trichlorofluoromethane 1,2,3-Trichloropropane 1,1,2-Trichlorotrifluoroethane 1,2,3-Trichlorotrifluoroethane 1,2,4-Trimethylbenzene 1,3,5-Trimethylbenzene Vinyl Chloride Xylenes m,p Xylenes o	50-150 50-150 50-150 D-221 50-150 50-150 50-150 46-157 64-148 47-163 50-150 50-150 52-162 52-162 52-150 71-157 17-181 50-150 50-150 50-150 50-150 50-150 50-150	30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0	0.050 ug/L
Method EPA 504			
CONSTITUENT	ACCURACY % RECOVERED	PRECISION RPD	MDL
DBCP EDB	70-130 70-130	30.0 30.0	0.001 ug/L 0.002 ug/L

QUALITY CONTROL ACCEPTANCE CRITERIA for ORGANIC METHODS

Method	EPA	505

CONSTITUENT	ACCURACY % RECOVERED	PRECISION RPD	MDL
Alachlor Aldrin Chlordane Dieldrin Endrin Heptachlor Heptachlor Epoxide Hexachlorobenzene Lindane Methoxychlor Toxaphene PCB 1016 PCB 1221 PCB 1232 PCB 1242 PCB 1248 PCB 1254 PCB 1254 PCB 1250	50-150 42-122 45-119 36-146 30-147 34-111 37-142 50-150 32-127 50-150 41-126 50-114 15-178 10-215 39-150 38-158 29-131 8-127	30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0	0.040 ug/L 0.005 ug/L 0.050 ug/L
CONSTITUENT	ACCURACY % RECOVERED	PRECISION RPD	MDL
1,3-Dimethyl-2-nitrobezer 9-Nitroanthracene Atrazine Simazine Molinate Thiobencarb Bromocil Diazinon Prometryne Dimethoate	50-150 50-150 70-130 70-130 70-130 70-130 70-130 70-130 70-130	30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0	0.000 ug/L 0.000 ug/L 0.100 ug/L 0.100 ug/L 0.200 ug/L 0.500 ug/L 0.200 ug/L 0.200 ug/L 0.200 ug/L
Method EPA 508			
CONSTITUENT	ACCURACY % RECOVERED	PRECISION RPD	MDL
Hexachlorobenzene Chlorothalonil	70-130 70-130	30.0 30.0	0.000 ug/L 0.020 ug/L

QUALITY CONTROL ACCEPTANCE CRITERIA for ORGANIC METHODS

Method EPA 51	5	. 1
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CONSTITUENT	ACCURACY % RECOVERED	PRECISION RPD	MDL
2,4,5-T 2,4-D 2,4,5-TP (Silvex) Bentazon Dalapon Dinoseb Pichloram	30-150 30-150 30-150 30-150 30-150 30-150 30-150	30.0 30.0 30.0 30.0 30.0 30.0	0.100 ug/L 1.000 ug/L 0.100 ug/L 0.200 ug/L 0.100 ug/L 0.100 ug/L 0.100 ug/L
Method EPA 524.2			
CONSTITUENT	ACCURACY % RECOVERED	PRECISION RPD	MDL
1,2-Dichloroethane-d4 Toluene-d8 BFB Benzene Bromobenzene Bromochloromethane Bromodichloromethane Bromomethane n-Butylbenzene sec-Butylbenzene tert-Butylbenzene Carbon Tetrachloride Chlorobenzene Chlorotoluene Chloroform Chloromethane 2-Chlorotoluene Dibromochlormethane Dibromomethane 1,2-Dichlorobenzene 1,3-Dichlorobenzene 1,4-Dichloroethane 1,1-Dichloroethane 1,1-Dichloroethane 1,1-Dichloroethylene cis-1,2-Dichloroethylene trans-1,2-Dichloroethylene	76-114 88-110 86-115 37-151 50-150 50-150 35-155 45-169 D-242 50-150 50-150 50-150 70-140 37-160 14-230 51-138 D-273 50-150	30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0	0.000 ug/L 0.000 ug/L 0.000 ug/L 0.050 ug/L

QUALITY CONTROL ACCEPTANCE CRITERIA for ORGANIC METHODS

Method EPA 524

CONSTITUENT	ACCURACY % RECOVERED	PRECISION RPD	MDL
1,2-Dichloropropane 1,3-Dichloropropane 2,2-Dichloropropane 1,1-Dichloropropene cis-1,3-Dichloropropene trans-1,3-Dichloropropene Ethyl Benzene Hexachlorobutadiene Isopropylbenzene p-Isopropyltoluene Methylene Chloride Naphthalene n-Propylbenzene Styrene 1,1,1,2-Tetrachloroethane 1,1,2,2-Tetrachloroethane Tetrachloroethylene Toluene 1,2,3-Trichlorobenzene 1,1,1-Trichloroethane 1,1,2-Trichloroethane 1,1,2-Trichloroethane 1,1,2-Trichloropropane 1,1,2-Trichlorotrifluoroethane 1,2,3-Trichlorotrifluoroethane 1,2,4-Trimethylbenzene 1,3,5-Trimethylbenzene Vinyl Chloride Xylenes m,p Xylenes o Acetone	RECOVERED D-210 50-150 50-150 50-150 D-227 17-183 37-162 50-150	RPD 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.	0.050 ug/L 0.050 ug/L
2-Butanone (MEK) Carbon Disulfide 1,2-Dibromo-3-chloropropane 1,2-Dibromoethane (EDB) 2-Hexanone 4-Methyl-2-pentanone (MIBK) Vinyl Acetate	50-150 50-150 50-150 50-150 50-150 50-150 50-150	30.0 30.0 30.0 30.0 30.0 30.0	0.050 ug/L 0.050 ug/L 0.050 ug/L 0.050 ug/L 0.050 ug/L 0.050 ug/L 0.050 ug/L

QUALITY CONTROL ACCEPTANCE CRITERIA for ORGANIC METHODS

<u>Method EPA 525</u>			
CONSTITUENT	ACCURACY % RECOVERED	PRECISION RPD	MDL
Perylene-dl2 bis(2-Ethylhexly)phthalate	50-150 29-137	30.0 30.0	0.100 ug/L 0.100 ug/L
Method EPA 531			
CONSTITUENT	ACCURACY % RECOVERED	PRECISION RPD	MDL
Aldicarb Sulfone Aldicarb Sulfoxide Oxymal Methomyl 3-Hydroxycarbofuran Aldicarb Propoxur Carbofuran Carbaryl 1-Napthol Methiocarb	70-130 70-130 70-130 70-130 70-130 70-130 70-130 70-130 70-130 70-130	30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0	1.000 ug/L 1.000 ug/L 1.000 ug/L 1.000 ug/L 2.000 ug/L 1.000 ug/L 1.000 ug/L 1.000 ug/L 1.000 ug/L 1.000 ug/L 2.000 ug/L
<u>Method EPA 547</u>			
CONSTITUENT	ACCURACY % RECOVERED	PRECISION RPD	MDL
Glyphosate	70-130	20.0	7.000 ug/L

QUALITY CONTROL ACCEPTANCE CRITERIA for ORGANIC METHODS

Metho	a	EPA	60.
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CONSTITUENT	ACCURACY % RECOVERED	PRECISION RPD	MDL
Bromodichloremethane Bromoform Bromomethane Carbon Tetrachloride Chlorobenzene Chloroethane Chloroform Chloromethane Dibromochlormethane 1,2-Dichlorobenzene 1,3-Dichlorobenzene 1,4-Dichlorobenzene Dichlorodifluoromethane 1,1-Dichloroethane 1,1-Dichloroethane 1,2-Dichloroethylene trans-1,2-Dichloropropane cis-1,3-Dichloropropene trans-1,3-Dichloropropene trans-1,3-Dichloropropene trans-1,1-Trichlorethane 1,1,2-Trichlorethane 1,1,1-Trichlorethane 1,1,2-Trichlorethane Trichlorofluoromethane Trichlorofluoromethane Vinyl Chloride	42-172 13-159 D-144 43-143 38-150 46-137 49-133 D-193 24-191 D-208 7-187 42-143 50-150 47-132 51-147 28-167 38-155 44-156 22-178 22-178 25-162 50-150 26-162 41-138 39-139 35-146 21-156 28-163	20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0	0.050 ug/L

Method EPA 602

CONSTITUENT	ACCURACY % RECOVERED	PRECISION RPD	MDL	
Benzene Toluene Ortho Xylene Para Xylene Meta Xylene Chlorobenzene Ethyl Benzene 1,2-Dichlorobenzene 1,3-Dichlorobenzene 1,4-Dichlorobenzene	39-150 46-148 50-150 50-150 50-150 55-135 32-160 37-154 50-141 42-143	20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0	0.050 0.050 0.050 0.050 0.050 0.050 0.050 0.050	ug/L ug/L ug/L ug/L ug/L ug/L ug/L ug/L

TABLE V-1 (cont'd.)

QUALITY CONTROL ACCEPTANCE CRITERIA for ORGANIC METHODS

Met	hod	EPA	604

PCB 1260

Method EPA 604			
CONSTITUENT	ACCURACY % RECOVERED	PRECISION RPD	MDL
2-Chlorophenol 2,4-Dichlorophenol 2,4-Dimethylphenol 4,6-Dinitro-o-cresol 2,4-Dinitrophenol 2-Methylphenol 4-Methylphenol 2-Nitrophenol 4-Nitrophenol p-Chloro-m-cresol Pentachlorophenol Phenol 2,4,5-Trichlorophenol 2,4,6-Trichlorphenol	23-134 39-135 42-109 D-181 D-191 50-150 50-150 29-182 29-182 22-147 14-176 5-112 37-144	30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0	1.000 ug/L 1.000 ug/L 1.000 ug/L 5.000 ug/L 5.000 ug/L 1.000 ug/L 1.000 ug/L 1.000 ug/L 2.000 ug/L 2.000 ug/L 1.000 ug/L 1.000 ug/L 1.000 ug/L 1.000 ug/L
Method EPA 608			
CONSTITUENT	ACCURACY % RECOVERED	PRECISION RPD	MDL
Hexachlorobenzene Dibutylchlorendate Aldrin Alpha BHC Beta BHC Delta BHC Chlordane o,p - DDD p,p - DDD o,p - DDE p,p - DDT p,p - DDT Dieldrin Endosulfan II Endosulfan II Endosulfan Sulfate Endrin Endrin Aldehyde Heptachlor Heptachlor Epoxide Lindane Methoxychlor Toxaphene PCR 1016	50-150 24-154 42-122 37-134 17-147 19-140 45-119 31-141 30-145 30-145 25-160 25-160 25-160 25-160 25-160 36-146 45-153 D-202 26-144 30-147 50-150 34-111 37-142 32-127 50-150 41-126 50-114	30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0	0.000 ug/L 0.000 ug/L 0.020 ug/L
PCB 1016 PCB 1221 PCB 1232 PCB 1242 PCB 1248 PCB 1254	15-178 10-215 39-150 38-158 29-131	30.0 30.0 30.0 30.0 30.0	0.200 ug/L 0.200 ug/L 0.200 ug/L 0.200 ug/L 0.200 ug/L 0.200 ug/L

8-127

30.0

0.200 ug/L

TABLE V-1 (cont'd.)

QUALITY CONTROL ACCEPTANCE CRITERIA for ORGANIC METHODS

Method EPA 614

CONSTITUENT	ACCURACY % RECOVERED	PRECISION RPD	MDL
1,3-Dimethyl-2-nitrobe 9-Nitroanthracene Azinphos Methyl Bolstar Chlorpyrifos Coumaphos Demeton-o,s Diazinon Dichlorvos Disulfoton Ethoprop Fensulfoton Fenthion Merphos Mevinphos Naled Parathion Methyl Phorate Ronnel Stirophos Tokuthion Trichlornate	50-150 50-150 50-150 50-150 50-150 50-150 50-150 50-150 50-150 50-150 50-150 50-150 50-150 50-150 50-150 50-150 50-150 50-150 50-150	30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0	0.000 ug/L 0.000 ug/L 0.200 ug/L
Method EPA 615 CONSTITUENT	ACCURACY	PRECISION	MDL
	% RECOVERED	RPD	
2,4,5-T 2,4-D 2,4,5-TP (Silvex)	50-150 50-150 50-150	30.0 30.0 30.0	0.100 ug/L 1.000 ug/L 0.100 ug/L

QUALITY CONTROL ACCEPTANCE CRITERIA for ORGANIC METHODS

Method EPA 624

CONSTITUENT	ACCURACY % RECOVERED	PRECISION RPD	MDL
1,2-Dichloroethane-d4 Toluene-d8 BFB Acetone Benzene Bromodichloromethane Bromoform Bromomethane Carbon Disulfide Carbon Tetrachloride Chlorobenzene Chloroethane Chloroform Chloromethane Dibromochlormethane 1,2-Dichlorobenzene 1,3-Dichlorobenzene 1,4-Dichloroethane 1,2-Dichloroethane 1,2-Dichloroethane 1,2-Dichloroethylene trans-1,2-Dichloropropene trans-1,3-Dichloropropene trans-1,3-Dichloropropene Ethanol Ethyl Benzene 2-Hexanone Methylene Chloride 2-Butanone (MEK) 4-Methyl-2-pentanone (MIBK) Styrene 1,1,2,2-Tetrachloroethane Tetrachloroethylene Toluene 1,1,1-Trichloroethane Trichlorofluoromethane Trichlorofluoromethane Trichlorofluoromethane Trichlorofluoromethane Trichlorofluoromethane Trichlorofluoromethane Vinyl Acetate Vinyl Chloride			N/A N/A N/A 5.000 ug/L 0.250 ug/L
Xylenes Acrolein Acrylonitrile	50-150 50-150 50-150	30.0 30.0 30.0	0.250 ug/L 10.000 ug/L 10.000 ug/L

QUALITY CONTROL ACCEPTANCE CRITERIA for ORGANIC METHODS

CONSTITUENT	ACCURACY % RECOVERED	PRECISION RPD	MDL
2-Fluorobiphenyl Nitrobenzene-d5 p-Terphenyl-d14 2-Fluorophenol Phenol-d6 2,4,6-Tribromophenol Acenaphthene Acenaphthene Acenaphtylene Aniline Anthracene Benzo(a) anthracene Benzo(b) fluoranthene Benzo(b) fluoranthene Benzo(g,h,i)perylene Benzylalcohol bis(2-Chloroethoxy)methane bis(2-Chloroethoxy)methane bis(2-Chloroisopropyl)ether bis(2-Ethylhexly)phthalate 4-Bromophenylphenylether Butylbenzylphthalate Chloronaphthalene Chloronaphthalene Chlorophenylphenylether Chrysene Dibenzo(a,h)anthracene Dibenzofuran 1,2-Dichlorbenzene 1,3-Dichlorbenzene 1,4-Dichlorobenzene 1,4-Dichlorobenzene 3,3'-Dichlorbenzidine Diethylphthalate Dimethylphthalate Dimethylphthalate Din-butylphthalate Din-butylphthalate Ch-Dinitrotoluene Di-n-octylphthalate Fluoranthene Fluorene Hexachlorobenzene Hexachlorobenzene Hexachlorobenzene Hexachlorobenzene Hexachlorobenzene			N/A N/A N/A N/A N/A N/A N/A 1.000 ug/L
Hexachloroethane Indeno(1,2,3-c,d)pyrene Isophorone 2-Methylnaphthalene	40-113 50-150 21-196 50-150	30.0 30.0 30.0 30.0	1.000 ug/L 1.000 ug/L 1.000 ug/L 1.000 ug/L
	-5 6-		

TABLE V-1 (cont'd.)

QUALITY CONTROL ACCEPTANCE CRITERIA for ORGANIC METHODS

Method EPA 625

CONSTITUENT	ACCURACY % RECOVERED	PRECISION RPD	MDL
		20.0	1 000/
Naphthalene	21-133	30.0	1.000 ug/L
Nitrobenzene	35-180	30.0	1.000 ug/L
N-Nitrosodimethylamine	50-150	30.0	1.000 ug/L
N-Nitrosodi-N-propylamine	D-230	30.0	1.000 ug/L
N-Nitrosodiphenylamine	50-150	30.0	1.000 ug/L
2-Nitroanaline	50-150	30.0	5.000 ug/L
3-Nitroanaline	50-150	30.0	5.000 ug/L
4-Nitroanaline	50-150	30.0	5.000 ug/L
Phenanthrene	54-120	30.0	1.000 ug/L
Pyrene	52-115	30.0	1.000 ug/L
1,2,4-Trichlorbenzene	44-142	30.0	1.000 ug/L
2-Chlorophenol	23-134	30.0	1.000 ug/L
2,4-Dichlorophenol	39-135	30.0	1.000 ug/L
2,4-Dimethylphenol	42-109	30.0	1.000 ug/L
4,6-Dinitro-o-cresol	D-181	30.0	5.000 ug/L
2,4-Dinitrophenol	D-191	30.0	5.000 ug/L
2-Methylphenol	50-150	30.0	1.000 ug/L
4-Methylphenol	50-150	30.0	1.000 ug/L
2-Nitrophenol	29-182	30.0	1.000 ug/L
4-Nitrophenol	11-114	50.0	5.000 ug/L
p-Chloro-m-cresol	22-147	30.0	2.000 ug/L
Pentachlorophenol	14-176	30.0	5.000 ug/L
Phenol	5-112	30.0	1.000 ug/L
2,4,5-Trichlorphenol	50-150	30.0	1.000 ug/L
2,4,6-Trichlorphenol	37-144	30.0	1.000 ug/L
Azobenzene	50-150	30.0	5.000 ug/L
Benzidine	50-150	30.0	5.000 ug/L
Benzoic Acid	50-150	30.0	5.000 ug/L
			-3/ -

CONSTITUENT	ACCURACY % RECOVERED	PRECISION RPD	MDL
Benzylchloride bis(2-Chloroisopropyl)ether Bromobenzene Bromochloromethane Bromodichloromethane Bromomethane Carbon Tetrachloride Chlorobenzene Chloroethane Chloroform	50-150 50-150 50-150 50-150 42-172 13-159 D-144 43-143 38-150 46-137 49-133	20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0	0.500 mg/kg

Method EPA 8010

CONSTITUENT	ACCURACY % RECOVERED	PRECISION RPD	MDL
1-Chlorohexane Chloromethane 2-Chlorotoluene Chlortoluene DBCP Dibromochlormethane 1,2-Dibromoethane Dibromomethane 1,2-Dichlorobenzene 1,3-Dichlorobenzene 1,4-Dichlorobenzene 1,1-Dichloroethane 1,2-Dichloroethylene cis-1,2-Dichloroethylene trans-1,2-Dichloroethylene trans-1,2-Dichloropropane 1,2-Dichloropropane 2,2-Dichloropropane 1,1-Dichloropropene cis-1,3-Dichloropropene trans-1,3-Dichloropropene trans-1,3-Dichloropropene trans-1,3-Dichloropropene trans-1,3-Dichloropropene trans-1,3-Dichloropropene trans-1,3-Dichloropropene 1,1-Dichlorobenzene 1,1,1-Trichlorobenzene 1,2,3-Trichlorobenzene 1,1,1-Trichlorethane 1,1,2-Trichlorethane 1,1,2-Trichlorethane 1,1,2-Trichlorethane 1,1,2-Trichlorethane 1,1,2-Trichlorethane 1,1,2-Trichlorethane 1,1,2-Trichlorethane 1,1,2-Trichlorobenzene	50-150 D-193 50-150 50-150 50-150 24-191 50-150 D-208 7-187 42-143 47-132 51-147 28-167 50-150 38-155 44-156 50-150 50-150 50-150 22-178 22-178 22-178 50-150 25-162 50-150 25-162 50-150 26-162 50-150 26-162 50-150 26-162 50-150 26-162 50-150 26-162 50-150 26-162 50-150	20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0	0.500 mg/kggggggggggggggggggggggggggggggggggg
Trichloropropane Vinyl Chloride	50-150 28-163	20.0 20.0	0.500 mg/kg 0.500 mg/kg

CONSTITUENT	ACCURACY % RECOVERED	PRECISION RPD	MDL	
Acetone Ethanol Ethyl Acetate Ethyl ether Methyl ethyl keton Methyl isobutyl ketone	50-150 50-150 50-150 50-150 50-150 50-150	40.0 40.0 40.0 40.0 40.0	0.500 0.500 0.500 0.500 0.500 0.500	mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg
2-Propanol (Isopropyl Alcohol)	50-150	40.0	0.500	mg/kg

TABLE V-1 (cont'd.)

QUALITY CONTROL ACCEPTANCE CRITERIA for ORGANIC METHODS

Method EPA 8020

CONSTITUENT	ACCURACY % RECOVERED	PRECISION RPD	MDL	
Benzene	39-159	20.0 20.0	0.001	mg/kg mg/kg
Toluene Ortho Xylene	46-148 50-150	20.0	0.001	mg/kg
Para Xylene	50-150	20.0	0.001	mg/kg
Meta Xylene	50-150	20.0	0.001	mg/kg
Chlorobenzene	55-135	20.0	0.001	mg/kg
Ethyl Benzene	32-160	20.0	0.001	mg/kg
1,2-Dichlorobenzene	37-154	20.0	0.001	mg/kg
1,3-Dichlorobenzene	50-141	20.0	0.001	mg/kg
1,4-Dichlorobenzene	42-143	20.0	0.001	mg/kg

CONSTITUENT	ACCURACY % RECOVERED	PRECISION RPD	MDL	
2-sec-Butyl-4-6-dinitrophenol 2-Chlorophenol 2,4-Dichlorophenol 2,4-Dimethylphenol 2,4-Dinitrophenol 2-Methyl-4,6-Dinitrophenol 2-Methylphenol 4-Methylphenol 4-Nitrophenol 4-Nitrophenol 4-Chloro-3-methylphenol Pentachlorophenol Phenol 2,3,4,6-Tetrachlorophenol 2,3,5,6-Tetrachlorophenol 2,3,5-Trichlorophenol 2,3,5-Trichlorophenol 2,3,6-Trichlorophenol	50-150 23-134 39-135 42-109 D-191 D-181 50-150 50-150 29-182 29-182 22-147 14-176 5-112 50-150 50-150 37-144 37-144	30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0	0.010 0.010 0.010 0.050 0.050 0.050 0.010 0.050 0.050 0.050 0.010 0.010 0.010	mg/kg mg/kg mg/kkg mg/kkg mg/kkg mg/kkg mg/kkg mg/kkg mg/kg mg/kg
2,4,5-Trichlorophenol 2,4,6-Trichlorophenol	37-144 37-144	30.0 30.0	0.010 0.010	mg/kg mg/kg

TABLE V-1 (cont'd.)

QUALITY CONTROL ACCEPTANCE CRITERIA for ORGANIC METHODS

Method EPA 8080

CONSTITUENT	ACCURACY % RECOVERED	PRECISION RPD	MDL
Hexachlorobenzene Dibutylchlorendate Aldrin Alpha BHC Beta BHC Delta BHC Chlordane o,p - DDD p,p - DDD p,p - DDE p,p - DDE p,p - DDT Dieldrin Endosulfan II Endosulfan Sulfate Endrin Endrin Aldehyde Heptachlor Heptachlor Epoxide Lindane Methoxychlor Toxaphene PCB 1016 PCB 1221 PCB 1232 PCB 1242 PCB 1248 PCB 1254 PCB 1254	50-150 20-150 34-132 37-134 17-147 19-140 45-119 31-141 30-145 30-145 23-134 23-134 23-134 23-134 23-134 23-134 45-153 D-202 26-144 42-139 50-150 35-130 37-142 46-127 50-150 41-126 50-114 15-178 10-215 39-150 38-158 29-131 8-127	30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 50.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0	N/A N/A 0.020 mg/kg 0.200 mg/kg

CONSTITUENT	ACCURACY % RECOVERED	PRECISION RPD	MDL
1,3-Dimethyl-2-nitrobenzene 9-Nitroanthracene Azinphos Methyl Bolstar Chlorpyrifos Coumaphos Demeton-o,s Diazinon Dichlorvos	50-150 50-150 50-150 50-150 50-150 50-150 50-150 -60-	30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0	N/A N/A 0.002 mg/kg

TABLE V-1 (cont'd.)

QUALITY CONTROL ACCEPTANCE CRITERIA for ORGANIC METHODS

Method EPA 8140			
CONSTITUENT	ACCURACY % RECOVERED	PRECISION RPD	MDL
Disulfoton Ethoprop Fensulfoton Fenthion Merphos Mevinphos Naled Parathion Methyl Phorate Ronnel Stirophos Tokuthion Trichlornate	50-150 50-150 50-150 50-150 50-150 50-150 50-150 50-150 50-150 50-150 50-150	30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0	0.002 mg/kg
Method EPA 8150			
CONSTITUENT	ACCURACY % RECOVERED	PRECISION RPD	MDL
2,4,5-T 2,4-D 2,4,5-TP (Silvex)	50-150 50-150 50-150	30.0 30.0 30.0	0.001 mg/kg 0.010 mg/kg 0.001 mg/kg
Method EPA 8240			
CONSTITUENT	ACCURACY % RECOVERED	PRECISION RPD	MDL
1,2-Dichloroethane-d4 Toluene-d8 BFB Acetone Benzene Bromodichloromethane Bromomethane Carbon Disulfide Carbon Tetrachloride Chlorobenzene Chloroethane Chloroform Chloromethane Dibromochlormethane	70-121 81-117 74-121 50-150 66-142 35-155 45-169 D-242 50-150 70-140 60-133 14-230 51-138 D-273 53-149	30.0 30.0 30.0 30.0 21.0 30.0 30.0 30.0 30.0 30.0 30.0	N/A N/A N/A 0.500 mg/kg 0.005 mg/kg 0.025 mg/kg

53-149 -61-

QUALITY CONTROL ACCEPTANCE CRITERIA for ORGANIC METHODS

Method EPA 8240

Method EPA 8240				
CONSTITUENT	ACCURACY % RECOVERED	PRECISION RPD	MDL	
1,2-Dichlorobenzene 1,3-Dichlorobenzene 1,4-Dichlorobenzene 1,1-Dichloroethane 1,2-Dichloroethylene trans-1,2-Dichloroethylene 1,2-Dichloropropane cis-1,3-Dichloropropene trans-1,3-Dichloropropene trans-1,3-Dichloropropene Ethanol Ethyl Benzene 2-Hexanone Methylene Chloride 2-Butanone (MEK) 4-Methyl-2-pentanone (MIBK) Styrene 1,1,2,2-Tetrachloroethane Tetrachloroethylene Toluene 1,1,1-Trichloroethane 1,1,2-Trichloroethane Trichlorofluoromethane Vinyl Acetate Vinyl Chloride Xylenes Acrolein Acrylonitrile	50-150 50-150 50-150 59-172 49-155 D-234 54-156 D-210 D-227 17-183 50-150 37-162 50-150 50-150 50-150 50-150 50-150 62-137 17-181 50-150 D-251 50-150 50-150 50-150	30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0	0.025 0.025 0.025 0.025 0.025 0.025 0.025 0.025 0.025 0.025 0.025 0.025 0.025 0.025 0.025 0.025 0.025 0.025 0.025	mg/kg mg/kg mg/kg mg/kg mg/kg mg/

CONSTITUENT	ACCURACY % RECOVERED	PRECISION RPD	MDL
2-Fluorobiphenyl Nitrobenzene-d5 p-Terphenyl-d14 2-Fluorophenol Phenol-d6 2,4,6-Tribromophenol Acenaphthene Acenaphthylene Aniline Anthracene	30-115 23-120 18-137 25-121 24-113 19-122 31-137 33-145 50-150 27-133 -62-	30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0	N/A N/A N/A N/A N/A N/A 0.100 mg/kg 0.100 mg/kg 0.500 mg/kg 0.100 mg/kg

CONSTITUENT	ACCURACY % RECOVERED	PRECISION RPD	MDL
Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Benzo(k)fluoranthene Benzo(g,h,i)perylene Benzylalcohol bis(2-Chloroethoxy)methane bis(2-Chloroethoxy)methane bis(2-Chloroethyl)ether bis(2-Ethylhexly)phthalate 4-Bromophenylphenylether Butylbenzylphthalate Chloroaniline Chloroaniline Chloroaniline Chlorophenylphenylether Chrysene Dibenzo(a,h)anthracene Dibenzofuran 1,2-Dichlorbenzene 1,3-Dichlorobenzene 1,4-Dichlorobenzene 3,3'-Dichlorobenzene 3,3'-Dichlorbenzidine Diethylphthalate Dimethylphthalate Din-butylphthalate Di-n-butylphthalate 2,4-Dinitrotoluene Di-n-octylphthalate Fluoranthene Fluorane Hexachlorobenzene Hoppinaphthalene Nideno(1,2,3-c,d)pyrene Isophorone 2-Methylnaphthalene Naphthalene Nitrosodimethylamine N-Nitrosodimethylamine N-Nitrosodimethylamine N-Nitrosodiphenylamine 2-Nitroanaline 3-Nitroanaline 4-Nitroanaline 4-Nitroanaline Phenanthrene	33-143 17-163 24-159 11-162 D-219 50-150 33-184 12-158 36-166 29-137 65-114 D-152 50-150 60-180 25-158 17-168 D-227 50-150 32-129 D-172 28-104 8-213 D-112 1-118 28-100 50-158 4-146 26-137 50-150 24-116 50-150 21-133 35-150 21-150 50-150 50-150 50-150 50-150 50-150 50-150 50-150 50-150 50-150 50-150 50-150 50-150	30.0 30.0	0.100 mg/kg
	-63-		

TABLE V-1 (cont'd.)

QUALITY CONTROL ACCEPTANCE CRITERIA for ORGANIC METHODS

CONSTITUENT		ACCURACY % RECOVERED	PRECISION RPD	MDL
Pyrene 1,2,4-Trichlorbenzene 2-Chlorophenol 2,4-Dichlorophenol 4,6-Dinitro-o-cresol 2,4-Dinitrophenol 2-Methylphenol 4-Methylphenol 2-Nitrophenol 4-Nitrophenol p-Chloro-m-cresol Pentachlorophenol Phenol 2,4,5-Trichlorphenol 2,4,6-Trichlorphenol Azobenzene Benzidine Benzoic Acid		35-142 38-107 25-102 39-135 42-109 D-181 D-191 50-150 50-150 29-182 11-114 26-103 17-109 26- 90 50-150 37-144 50-150 50-150	36.0 23.0 50.0 30.0 30.0 30.0 30.0 30.0 30.0 3	0.100 mg/kg 0.100 mg/kg 0.100 mg/kg 0.100 mg/kg 0.100 mg/kg 0.500 mg/kg 0.500 mg/kg 0.100 mg/kg 0.100 mg/kg 0.100 mg/kg 0.100 mg/kg 0.100 mg/kg 0.500 mg/kg
Method TOC				
CONSTITUENT		ACCURACY % RECOVERED	PRECISION RPD	MDL
TOC TOC	415.1 9060	80-120 80-120	20.0 20.0	0.300 mg/L 3.000 mg/kg
Method TOX				
CONSTITUENT		ACCURACY % RECOVERED	PRECISION RPD	MDL
TOX	9020	80-120	20.0	0.500 ug/L

TABLE V-1 (cont'd.)

QUALITY CONTROL ACCEPTANCE CRITERIA for ORGANIC METHODS

Method UGSTA-L	
CONSTITUENT	

CONSTITUENT	9	ACCURACY & RECOVERED	PRECISION RPD	MDL	
Benzene Ethyl Benzene Toluene Xylene TPH-Gas TPH-Desiel TPH-By IR EDB Total Lead Organic Lead	602 602 602 8015 8015M 418.1 624 7421 DHS/LUFT	39-150 32-160 46-148 50-150 70-130 70-130 50-150 50-150 75-125 50-150	20.0 20.0 20.0 40.0 40.0 20.0 20.0 20.0	0.050 0.050 0.001 0.001 0.050 0.050 0.050 0.050 5.000	ug/L ug/L ug/L mg/L mg/L mg/L ug/L ug/L
Method UGSTA-S					
			DDCGTGTGU	1451	

CONSTITUENT	%	ACCURACY RECOVERED	PRECISION RPD	MDL	
Benzene Ethyl Benzene Toluene Xylene TPH-Gas TPH-Desiel TPH-By IR EDB	8020 8020 8020 8020 8015 8015M 418.1 8010	39-159 32-160 46-148 50-150 35-100 35-100 50-150	20.0 20.0 20.0 20.0 40.0 40.0 20.0 20.0	0.001 0.001 0.001 0.500 0.500 1.000	mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg
Total Lead Soluble Lead Organic Lead	7420 7420 DHS/LUFT	75-125 30-100 50-150	20.0 20.0 20.0	4.000 0.400 0.400	mg/kg mg/kg mg/kg

TABLE V-3

CONSTITUENT	METHOD	Accuracy % Recovered	Precision RPD	MDL	
Gross Alpha	900.0	80-120	20.0	0.100	pCi/L
Gross Beta	900.0	80-120	20.0		pCi/L
Radon	913.0	80-120	20.0	10.000	pCi/L
Strontium 90	905.0	80-120	20.0		pCi/L
Total Radium	900.1	80-120	20.0		pCi/L
Tritium	906.0	80-120	20.0	200.000	
Uranium	908.0	80-120	20.0		pCi/L

CONSTITUENT	METHOD	Accuracy % Recovered	Precision RPD	MDL
% Moisture % Solids Alkalinity (as CaCO3) Alkalinity (as CaCO3) Alwinum Aluminum Aluminum Ammonia Ammonia-N Ammonia-N Ammonium Nitrogen Antimony Antimony Antimony Arsenic Arsenic Arsenic BOD - Soluble Barium Barium Beryllium Beryllium Beryllium Beryllium Bicarbonate Bicarbonate Bicarbonate Bicarbonate Boron Boron Boron COD COD - Soluble Cadmium Cadmium Cadmium Cadmium Cadmium Cadmium Cadmium Cadmium	ASA/UL 310.0 310.0 310.0 310.0 6010 7021 202.2 350.1 350.1 350.1 350.1 7041 7041 204.2 7060 206.2 405.1 6010 6010 200.7 310.1 310.1 6010 200.7 410.2 6010 6010 7131 213.2	% Recovered NA NA NA NA NA 70-130 75-125 75-125 80-120 70-130 80-120 70-130 80-125 65-135 75-125 65-135 75-125 80-120 80-120 70-130 80-120 70-130 80-120 70-130 80-120 70-130 80-120 70-130 80-120 70-130 80-120 70-130 80-120 75-125 75-125	RPD 30.0 30.0 20.0 30.0 20.0 30.0 20.0 30.0 20.0 30.0 20.0 30.0 20.0 2	N/A N/A 0.100 mg/L 0.100 mg/L 0.100 mg/kg 0.005 mg/L 5.000 mg/L 0.100 mg/L 0.005 mg/L 0.005 mg/L 0.005 mg/L 0.005 mg/L 0.000 mg/L 0.100 mg/L 0.010 mg/L 0.010 mg/L 0.005 mg/L 0.005 mg/L 0.000 mg/L 0.000 mg/L 0.100 mg/L
Calcium Calcium Calcium	6010 6010 200.7	80-120 70-130 80-120	20.0 30.0 20.0	0.001 mg/L 5.000 mg/kg 0.100 mg/L
Carbon Dioxide Carbonate Carbonate	SM406 310.1 310.1	NA NA NA	20.0 20.0 20.0	0.100 mg/L 0.100 meq/L 0.100 mg/L
		-67-		

Accuracy Precision	
the state of the s	
CONSTITUENT METHOD % Recovered RPD MDL	
Chloride SM407C 80-120 20.0 0.100 me	n /1
Chloride SM407C 80-120 20.0 0.100 mg	
011101110	/kg
Chlorine Residual 330.3 NA 20.0 0.010 mg	
Chromium 6010 D-120 50.0 0.030 mg	
Chromium 6010 70-130 30.0 0.001 mg	
Chromium 7191 80-120 20.0 0.001 mg	
Chromium 218.2 75-125 20.0 1.000 ug	
Chromium VI 7196 D-120 20.0 0.001 mg	
Chromium VI 7196 D-130 30.0 0.001 mg	/kg
Cobalt 6010 D-120 50.0 0.030 mg	/L
Cobalt 6010 70-130 30.0 0.005 mg	/kg
Cobalt 200.7 80-120 20.0 5.000 ug	
Color 110.3 NA 20.0 0.300 un	
Conductivity 120.1 80-120 20.0 0.100 um	
Copper 6010 D-120 50.0 0.030 mg	
Copper 6010 70-130 30.0 0.300 mg	/kg
Copper 7210 80-120 20.0 0.005 mg	
Copper 7210 70-130 30.0 0.005 mg	
Copper 200.7 80-120 20.0 5.000 ug Copper 220.1 80-120 20.0 5.000 ug	
	/ L
Corrosivity (pH) NA 20.0 N/A Cyanide, Total 335.2 75-125 20.0 0.005 mg	/1
	/kg
Dilute Acid or Base NA 20.0 0.000	
• · · • · · · · · · · · · · · · · · · ·	nos
Fluoride by Dist. 340.1 70-130 30.0 0.010 mg	
Fluoride by electrode 340.2 80-120 20.0 0.010 mg	
Gold 231.1 80-120 20.0 0.005 mg	/L
Gold 231.1 70-130 30.0 0.005 mg	/kg
Gypsum Requirement Calc. NA N/A N/A	
Hardness, Total 130.2 80-120 20.0 0.100 mg	/L
Hydroxide 310.0 NA 20.0 0.100 mg	/ L
Ignitability NA 30.0 N/A	
Ignitability NA N/A N/A	/1
Iron 6010 80-120 20.0 0.005 mg Iron 6010 70-130 30.0 0.300 mg	
Iron 6010 70-130 30.0 0.300 mg Iron 200.7 80-120 20.0 0.005 mg	/ N 9 /1
Iron 200.7 80-120 20.0 5.000 ug	/1
Iron 236.1 80-120 20.0 5.000 ug	/L
Kjeldahl Nitrogen 351.2 75-125 20.0 0.100 mg	/L
Kjeldahl Nitrogen 351.2 65-135 30.0 0.100 mg	/ka
Langelier Index SM203 NA N/A 0.100 mg	

CONSTITUENT	METHOD	Accuracy % Recovered	Precision RPD	MDL
Lead	7420	D-120	50.0	0.040 mg/L
Lead	7420	70-130	30.0	0.400 mg/kg
Lead	7421	75-125	20.0	0.040 mg/L
Lead	7421	65-135	30.0	0.001 mg/kg
Lead	239.2	75-125	20.0	0.500 ug/L
Lithium	7430	80-120	20.0	0.005 mg/L
Lithium	7430	70-130	30.0	0.005 mg/kg
Lithium	SM303A	80-120	20.0	5.000 ug/L
MBAS	425.1	70-130	20.0	0.002 mg/L
Magnesium	6010	80-120	20.0	0.001 mg/L
Magnesium	6010	70-130	30.0	5.000 mg/kg
Magnesium	200.7	80-120	20.0	0.100 mg/L
Manganese	6010	80-120	20.0	0.003 mg/L
Manganese	601 0	70-130	30.0	0.200 mg/kg
Manganese	200.7	80-120	20.0	0.005 mg/L
Manganese	200.7	80-120	20.0	3.000 ug/L
Manganese	243.1	80-120	20.0	3.000 ug/L
Mercury	7470	D-125	50.0	0.001 mg/L
Mercury	7470	65-135	30.0	0.001 mg/kg
Mercury	7471	75-125	20.0	0.001 mg/L
Mercury	7471	65-135 75-135	30.0	0.005 mg/kg
Mercury	245.1	75-125	20.0	0.100 ug/L
Molybdenum	6010	D-120	50.0 30.0	0.030 mg/L 0.003 mg/kg
Molybdenum	6010 200 .7	70-130 80-120	20.0	
Molybdenum	6010	D-120	50.0	5.000 ug/L 0.030 mg/L
Nickel Nickel	6010	70-130	30.0	0.300 mg/kg
Nickel	249.1	80-120	20.0	5.000 ug/L
Nitrate	353.2	80-120	20.0	0.100 meq/L
Nitrate	353.2	80-120	20.0	0.100 mg/L
Nitrate	353.2	70-130	30.0	0.100 mg/kg
Nitrate Nitrogen	353.2	80-120	20.0	0.020 mg.L
Nitrate Nitrogen	353.2	80-120	20.0	0.020 mg/L
Nitrate Nitrogen	353.2	70-130	30.0	0.020 mg/kg
Nitrite	353.2	80-120	20.0	0.100~mg/L
Nitrite	353.2	70-130	30.0	0.100 mg/kg
Nitrite Ni trogen	35 3.2	80-120	20.0	0.020~mg/L
Nitrite Nitrogen	35 3.2	70-130	30.0	0.020 mg/kg
Nitrogen, Organic	Calc.	NA	20.0	0.100 mg/L
Nitrogen, Organic	Calc.	NA	30.0	0.100 mg/kg
Nitrogen, Total	351.2	80-120	20.0	0.100 mg/L
Nitrogen, Total	351.2	70-130	30.0	0.100 mg/kg
Nitrogen, <u>Total</u>	Calc.	NA	20.0	0.100 mg/L
Nitrogen, Total	Calc.	NA	30.0	0.100 mg/kg
0dor	140.1	NA	20.0	0.100 TON
Oil and Grease	413.1	NA NA	20.0	0.100 mg/L
Oil and Grease	413.1	NA NA	30.0	0.100 mg/kg
Oxygen, dissolved	360.1	NA -69-	20.0	0.050 mg/L
		-69-		

CONSTITUENT	METH O D	Accuracy % Recovered	Precision RPD	MDL
Phenols	420.1	75-125	20.0	0.010 mg/L
Phenols	420.1	65-135	30.0	0.010 mg/kg
Phosphate	365.2	80-120	20.0	0.010 mg/L
Phosphate (Phosphorous	365.2	70-130	30.0	0.010 mg/kg
Phosphorous, Total	365.2	75-125	20.0	0.010 mg/L
	365.4	75-125	20.0	0.010 mg/L
	365.4	65-135	30.0	0.010 mg/kg
Potassium	6010	80-120	20.0	0.001 mg/L
Potassium	6010	70-130	30.0	5.000 mg/kg
Potassium	200.7	80-120	20.0	0.100 mg/L
Reactivity Sulfide		NA	30.0	N/A
Selenium	7740	75-125	20.0	0.001 mg/L
Sel enium	7740	65-135	30.0	0.001 mg/kg
Selenium	270.2	75-125	20.0	0.500 ug/L
Silica	6010	80-120	20.0	0.100 mg/L
Silver	7760	D-120	50.0	0.030 mg/L
Silver	7760	70-130	30.0	0.300 mg/kg
Silver	7761	75-125	20.0	0.001 mg/L
Silver	7761	65-135	30.0	0.001 mg/kg
Silver	272.2	75-125	20.0 20.0	1.000 ug/L 0.001 mg/L
Sodium	6010 6010	80-120 70-130	30.0	5.000 mg/kg
Sodium	200.7	80-120	20.0	0.100 mg/L
Sodium Solids, Settleable	160.5	NA	20.0	0.010 ml/L
Solids, Total	160.1	NA NA	20.0	0.400 mg/L
Solids, suspended	160.2	NA NA	20.0	1.000 mg/L
Solids, volatile	160.4	NA NA	20.0	1.000 mg/L
Sulfate	375.4	80-120	20.0	0.100 meg/L
Sulfate	375.4	80-120	20.0	0.100 mg/L
Sulfate	375.4	70-130	30.0	0.100 mg/kg
Sulfide	376.2	NA	20.0	0.005 mg/L
Sulfide	376.2	NA	30.0	0.005 mg/kg
Sulfide, Dissolved	376.2	NA	20.0	0.005 mg/L
TDS	160.1	NA	20.0	0.400 mg/L
TDS	160.1	NA	20.0	0.400 ml/L
TDS by Summation	Calc.	NA	20.0	0.100 mg/L
Tannin & Lignin	SM513	NA D. 125	20.0	0.000 mg/L
Thallium	7840 7840	D-125	50.0	0.030 mg/L
Thallium	78 40	65-135 75-135	30.0	0.300 mg/kg
Thallium	7841 7841	75-125 65 135	20.0 30.0	0.002 mg/L 0.002 mg/kg
Thallium	7841 279.2	65-135 75-125	20.0	2.000 ug/L
Thallium Tin	7871	75-125 75-125	20.0	0.005 mg/L
Tin	7871 7871	65-135	30.0	0.005 mg/kg
Turbidity	180.1	NA	20.0	0.020 NTU
Vanadium	6010	D-120	50.0	0.030 mg/L
Vanadium	6010	70-130	30.0	0.300 mg/kg
Vanadium	200.7	80-120	20.0	5.000 ug/L
		-70-		J.

TABLE V-2 (cont'd.)

CONSTITUENT	METHOD	Accuracy % Recovered	Precision RPD	MDL
Zinc	6010	D-120	50.0	0.030 mg/L
Zinc	6010	70-130	30.0	0.300 mg/kg
Zinc	7950	80-120	20.0	0.005 mg/L
Zinc	7950	70-130	30.0	0.005 mg/kg
Zinc	200.7	80-120	20.0	5.000 ug/L
Zinc	289.1	80-120	20.0	5.000 ug/L
рH	150.0	NA	20.0	N/A
рН	150.1	NA	20.0	N/A
р́Н	150.1	NA	20.0	N/A

TABLE V-4

BFB KEY ION ABUNDANCE CRITERIA

Mass	Ion Abundance Criteria .
50	15 to 40% of mass 95
75	30 to 60% of mass 95
95	base peak, 100% relative abundance
96	5 to 9% of mass 95
173	less than 2% of mass 174
174	greater than 50% of mass 95
175	5 to 9% of mass 174
176	greater than 95% but less than 101% of mass 174
177	5 to 9% of mass 176

TABLE V-5

DFTPP KEY IONS AND ION ABUNDANCE CRITERIA

Mass	Ion Abundance Criteria .
51	30 to 60% of mass 198
68	less than 2% of mass 69
70	less than 2% of mass 69
127	40 to 60% of mass 198
197	less than 1% of mass 198
198	base peak, 100% relative abundance
199	5 to 9% of mass 198
275	10 to 30% of mass 198
365	greater than 1% of mass 198
441	Present but less than mass 443
442	greater than 40% of mass 198
443	17 to 23% of mass 442

VI. Internal Quality Control

Introduction

An internal quality control program requires a set of routine internal procedures for assuring that the data generated from a measurement system meets prescribed criteria for data quality. An effective internal QC program must be capable of measuring and controlling the quality of the data, in terms of precision, accuracy, and completeness. Data is considered to be complete only if all method specific control measures have been taken, and the data can only be reported when all acceptance criteria have been met, including corrective actions, if applicable.

This section identifies QC protocols associated with analytical procedures. Included are general quality control measures as well as specific quality control checks which provide continual control and assessment of data quality, in terms of precision, accuracy, and completeness. Table VI-1 contains general QC measure for some representative wet chemistry methods. Figure VI-1 is an example of an FGL Batch Control Chart. FGL's LIMS System is also capable of generating historic control charts. Control limits are updated quarterly bsed on actual data. Figure VI-2 is an FGL QC Inspection Report Form, and Figure VI-3 is a copy of FGL's laboratory certificate issued by California Department of Health Services.

Sources and Preparation of Standards

Chemicals used in the laboratory are obtained from major suppliers and are usually reagent grade or better. All reagents are labeled with date received, and date opened. Standards are also obtained from these suppliers and certification documents are kept on file. The date the standard was received is recorded on the document. Labels are attached to each standard and contain the following: Element, date prepared, prepared by, source verification and expiration date. A log book for the standards prepared from the commercial standards is also kept which is labeled indicating the source, the volume of standard used, the date prepared, the name of the analyst/preparer, and how verified. In those instances where the above procedure is not possible, the chemist notebook will contain this information.

EPA 500 and 600 Series and SW846 GC Methods

Analytical quality control protocols for GC analyses and described in Method 8000 of SW846, 3rd ed. and equivalent procedures in the 500 and 600 series EPA methods. They include the following:

- Initial demonstration of capability
- Calibration
- Analysis of surrogate spiked samples
- Method blank analyses
- Analysis of matrix spike/matrix spike duplicates
- Duplicate sample analyses
- Analysis of QC check samples and/or method spikes
- Retention time window checks

These procedures are described below.

Initial Demonstration of Capability

Before analyzing samples, the laboratory must demonstrate the ability to generate accurate and precise data. This is achieved by analyzing four aliquots of a QC check sample (QCCS) by the same procedure intended for sample analysis. The laboratory must calculate the average recovery and the standard deviation of the recovery for each analyte of interest using the four results. The mean recovery and standard deviation for each analyte must be compared with the corresponding acceptance criteria published in the EPA method. If and only if the experimental accuracy and precision data are acceptable, certification for the method is pursued through the Environmental Laboratory Accreditation Program offered by the California Department of Health Services.

<u>Calibration</u> - Calibration standards at three concentration levels are prepared by dilution of stock standards. The average calibration factor is acceptable if the RSD between the factors is within 20 percent. Daily calibration checks are acceptable if the daily calibration factor is within 30 percent of the previous three level average.

<u>Surrogate Spikes</u> - A surrogate standard is a compound not expected to occur in an environmental sample but has chemical behavior similar to that of the target analytes. Surrogate spikes are used according to specific method requirements published by the EPA. They serve as a check on the extraction process where extraction is a necessary part of the analytical procedure. When surrogate recovery is within limits it indicates that the extraction was complete. If the surrogate spike recovery in any sample is not within limits:

- Check for errors in calculations, surrogate solutions and standards. Check instrument performance.
- Recalculate the data and/or reanalyze the extract if any of the above checks reveal a problem.
- Re-extract and reanalyze the sample if none of the above are a problem, or flag the data as "estimated concentration".

Method Blank Analysis - Before processing any samples, the analyst must demonstrate through the analysis of a reagent water method blank that all glassware and reagents are free of interferences. Each time a set of samples is extracted, a method blank must be processed to check for laboratory contamination. The blank samples should be carried through all stages of the sample preparation and analysis. Lack of interference is demonstrated if all target analytes with the exception of common laboratory reagents are below their MDLs.

QC Check Sample Analyses - QC check samples may be obtained directly from EPA or prepared from suitable reference standards, but must be prepared independently of calibration standards. The QCCS usually contains the analyte(s) of interest at a concentration in the mid-calibration range. A QCCS should be analyzed if matrix spike recoveries are unacceptable to verify that the analysis is in control.

Matrix Spike/Matrix Spike Duplicate Analyses (MS/MSD) - EPA protocol recommends analysis of matrix spike and matrix spike duplicate samples for each analytical batch or matrix type at a minimum frequency of five percent. The method recovery limits and relative percent difference (RFD) acceptance criteria are shown in Section V. When matrix spike results fall outside limits published in the respective methods, a QCCS should be analyzed to demonstrate control. If spike recoveries are outside normal limits due to matrix problems, the data should be reported noting matrix interference.

EPA 600 series protocol requires analysis of one matrix spike at a ten percent minimum frequency. A single matrix spike analysis will suffice for low level water samples where matrix effects are less likely. These recovery measurements serve as useful indicators of accuracy.

<u>Duplicate Sample Analysis</u> - EPA protocol requires duplicate sample analysis at a ten percent minimum frequency. The relative percent difference (RPD) calculated from MS/MSD analyses provides an assessment of precision. This approach is useful for typically having no detectable amounts of analyte.

Retention Time Windows - The laboratory calculates retention time windows for each standard on each GC column whenever a new GC column is installed. To establish windows, make three injections of standard throughout the course of a 72 hour period. Calculate the standard deviation of the three individual retention times for each standard. For multi-response products, (i.e. PCB's) choose one major peak from the pattern. If the standard deviation for a particular standard is zero, use the standard deviation of a close eluting, similar compound to develop a valid retention time window.

The laboratory establishes <u>daily</u> retention time windows for each analyte. The absolute retention time for each daily calibration standard serves as the midpoint of the window for that day. The daily retention time window equals the midpoint + three standard deviations as determined above.

EPA 500 and 600 Series and SW846 GC/MS Methods

Analytical quality control protocols for GC/MS analyses are described in Method 8000 of SW846, 3rd ed. and equivalent methods in the 500 and 600 series EPA methods. They include:

- Initial demonstration of capability
- Calibration verification
- Surrogate standard spike samples
- Reagent (Method) blank analyses
- Matrix spike duplicate analyses
- Analysis of duplicate samples (EPA 600 series)
- Mass spectrometer sensitivity check
- Daily GC/MS performance tests

Initial Demonstration of Capability - Before analyzing samples the laboratory must demonstrate the ability to generate accurate and precise data. This is achieved by analyzing four aliquots of a QC check sample (QCCS) by the same procedure intended for sample analysis. The laboratory must calculate the average recovery and the standard deviation of the recovery for each analyte of interest using the four results. The mean recovery and standard deviation for each analyte must be compared with the corresponding acceptance criteria published in the EPA method. If, and only if, the experimental accuracy and precision data are acceptable, certification for the method is pursued through the Environmental Laboratory Accreditation Program offered by the California Department of Health Services.

<u>Calibration</u> - Calibration standards at five concentration levels are prepared by dilution of stock standards. The average calibration factor is acceptable if the RSD between the factors is within 20 percent. Daily calibration checks are acceptable if the daily calibration factor is within 25 percent of the previous five level average.

<u>Surrogate Spikes</u> - All samples are spiked with surrogate standards as described in the EPA method. The method recovery acceptance limits for GC/MS methods are included in Section V, Table V-1. If the surrogate spike recovery in any sample is not within limits;

- Check for errors in calculations, reagents and standards. Check instrument performance.
- Recalculate the data and/or reanalyze the sample if any of the above checks reveal a problem
- Re-extract and reanalyze the sample if none of the above reveal the problem, or flag the data as "estimated concentration"

Method Blank Analyses - A method blank should be analyzed every 12 hours to demonstrate that interferences are below critical limits. The blank samples should be carried through all stages of the sample preparation (including extraction for semi-volatiles) and analysis. Lack of interference is demonstrated if all target analytes with the exception of common laboratory contaminants are below their MDLs. For volatile analyses the common laboratory contaminants, methylene chloride, acetone, 2-butanone and toluene, must not exceed five (5) times their MDLs. For semi-volatile analyses the common laboratory contaminants, phthalate esters, must not exceed five (5) times their MDLs.

QC Check Sample Analyses - QC check samples may be obtained directly from EPA or prepared from suitable reference standards, but must be prepared independently of calibration standards. The QCCS usually contains the analyte(s) of interest at a concentration in the mid-calibration range. A QCCS should be analyzed if matrix spike recoveries are unacceptable to verify that the analysis is in control.

Matrix Spike/Matrix Spike Duplicate Analyses (MS/MSD) - EPA protocol requires analysis of matrix spike and matrix spike duplicate samples for each analytical batch or matrix type at a minimum frequency of five percent. The method recovery limits and RPD acceptance criteria are shown in Section V. When matrix spike recoveries fall outside limits published in the respective methods, a QCCS should be analyzed to demonstrate control. If spike recoveries are outside normal limits due to matrix problems, the data should be reported noting matrix interference.

EPA 600 series protocol requires analysis of one matrix spike at a five percent minimum frequency. These matrix spike mixtures contain all of the target compounds. A single matrix spike analysis will suffice for low level water samples where matrix effects are less likely. These recovery measurements serve as useful indicators of accuracy.

<u>Duplicate Sample Analysis</u> - EPA protocol recommends duplicate analysis at a five percent minimum frequency. The RPD calculated from MS/MSD analyses provides a useful assessment of precision. This approach is recommended for water samples typically having no detectable amounts of analyte.

Mass Spectrometer Sensitivity Check – If the extracted ion current profile (EICP) area for any internal standard changes by more than a factor of two (-50% – +100%), the mass spectrometer must be inspected for malfunctions and correction action taken. Samples analyzed while the system was malfunctioning must be reanalyzed; there are no exceptions.

<u>Daily GC/MS Performance Tests</u> - Each day that analyses are performed, the GC/MS system will be checked using bromofluorobenzene (BFB) or decafluorotriphenylphosphine (DFTPP). The acceptance criteria presented in Section V, Tables V-4 and V-5 must be met prior to performing any analyses. If all criteria are not met, the instrument will be retuned and the test repeated until all criteria are achieved; there are no exceptions.

EPA 200 Series and SW846 Metals Methods

Metals Analyses by ICPES and Atomic Absorption - The quality control protocols associates with metals analyses are described in SW846 Method 6010 (EPA Method 200.7) for ICPES and Method 7000 (EPA Methods 206.2, 270.2, 245.1, 239.1) series for atomic absorption. They include:

- Calibration verification
- Analysis of QC check samples
- Calibration blank analyses
- Reagent blank analyses
- Analysis of matrix spike/matrix spike duplicates
- Instrument check standard analyses

These procedures are described below.

<u>Calibration</u> - Calibration standards at two concentration levels in the instruments Linear Range are prepared by diluting stock standards. These standards must be analyzed with each batch prior to sample analysis; there are no exceptions.

QC Check Sample Analyses - Immediately after calibration, a quality control check sample (QCCS) containing all elements of interest is analyzed. The results are calculated prior to analyzing any other samples. The QC standard is purchased from a commercial source. The QCCS should be prepared in the same acid matrix as the calibration standards at the mid-calibration range.

After every ten samples, the QC standard is reanalyzed. The measured value must fall in the acceptable range published by the manufacturer. If not, the instrument must be recalibrated.

<u>Calibration Blank (ICPES)</u> - At a frequency of ten percent, a calibration blank is analyzed during sample analyses. As described in Method 6010, this standard is prepared by diluting 2 mL of (1+1) HNO3 and 10 mL of (1+1) HCl to 100 mL DI H20. If response to this standard is verified to be outside three standard deviations of the mean calibration blank value, then correct the problem, recalibrate, and reanalyze the previous ten samples.

Reagent Blank - A reagent blank, containing all the reagents and in the same volumes as used in the processing of the samples and carried through the complete preparation/analysis procedure, should be analyzed at a minimum frequency of five percent, or one per sample batch. Reagent blank results should be used to correct for possible contamination resulting from varying amounts of the acids used in processing samples.

Matrix Spike/Matrix Spike Duplicate - For each analytical batch or matrix type (five percent minimum frequency), matrix spike and matrix spike duplicate samples should be analyzed. Matrix spike results should fall within the acceptable percent recovery range listed in Section V. If the spike is not recovered within the specified limits, the data should be flagged as suspect due to matrix effects. Depending on the project, provisions are established to use standard-addition analysis procedures to compensate for matrix effects.

Duplicate spiked sample results should agree within the acceptable percent RPD listed in Section V. If they do not, evaluate the system for the source of the imprecision, and correct the problem.

Total Organic Carbon

Determination of Total Organic Carbon is performed according to EPA 415.1 and 9060. Quality control measures include the following:

- Calibration
- OC Check Samples
- Method Blanks
- Matrix Spike/Matrix Spike Duplicates

These procedures are described below.

<u>Calibration</u> - For water samples, multiple calibrations (3) in the 0-50 ppm range are performed daily prior to sample analysis. If the calibration areas are within ten percent of one another the analysis may proceed. If not, repeat calibration. For solid samples, a one point single calibration is performed using 150 microliters of 1000 ppm carbon standard injected onto quartz wool and pyrolyzed.

QC Check Samples - QC check samples are obtained commercially (ERA and NIST) and are analyzed immediately after calibration and at the end of the analysis. The QC check sample must fall within 80 to 120 percent of the true value. If not, it must be reanalyzed. If still out of limits all samples must be reanalyzed after checking the entire system for errors. For soil samples, QC check samples are analyzed first, last, and at a minimum frequency of ten percent.

Method Blanks - Method blanks apply to water samples only, and are analyzed immediately following the first QC check sample. The result should be zero. If not, reagent blanks must be performed, the system recalibrated, and the QC check sample reanalyzed prior to re-analysis of the blank.

Matrix Spike/Matrix Spike Duplicates - Matrix spike/matrix spike duplicates are analyzed at a minimum frequency of ten percent for water samples. The acceptance limits shown in Section V must be met, otherwise the samples must be reanalyzed. Since matrix spikes are applicable to soil samples (sample size = 10 mg), all samples are analyzed in duplicate, and the precision limits listed in Section V must be met. Otherwise, the samples must be reanalyzed.

Total Organic Halogens (TOX)

Determination of TOX is performed according to EPA 9020. Quality control measures include the following:

- Test titrations
- Calibration
- Matrix spike/matrix spike duplicates

These procedures are described below.

<u>Test Titrations</u> - Prior to sample analysis, two test titrations must be performed. The end points must be within five millivolts of one another, and the gain readings must meet the criteria published by EPA in Method 9020. If out of limits, check the system and run duplicate test titrations until the criteria are met.

<u>Calibration</u> - Direct injection of known amounts of analyte to the pyrolysis tube are performed prior to sample analysis to check cell recovery. This must be performed in duplicate and the recovery must be within 80 to 120 percent for both. If out of limits, check the system and run duplicate calibrations until the criteria are met.

Matrix Spike/Matrix Spike Duplicates - Matrix spike/matrix spike duplicates are analyzed at a minimum frequency of ten percent. Both results must be within 80 to 120 percent of the true value with a 20 percent RPD maximum. Otherwise, check the system and reanalyze duplicate matrix spikes until the criteria are met. If unable to meet acceptance limits, the analysis must be redone from the beginning unless matrix interference can be cited.

Gross Alpha/Beta

Gross alpha/beta analysis is performed according to EPA 900.0. Quality control measures include the following:

- Efficiency vs. solids chart
- Background
- EC measurement
- Matrix spike/matrix spike duplicates

These procedures are described below.

Note: Samples above the MCL for alpha/beta must be recounted for verification.

Efficiency vs. Solids Chart - Prior to analyzing any samples, for each instrument an efficiency vs. solids chart must be generated as part of the initial demonstration of capability. In addition, whenever an instrument is maintained or repaired (i.e. a counting wire replaced) a new efficiency vs. solids charge must be generated. Only NBS traceable standards may be used. Samples containing solids such that the efficiency of counting drops below ten percent must be reset using a smaller aliquot so that the solids give acceptable counting efficiency.

<u>Background</u> - Background samples are run daily, prior to sample analysis. However, a weekly average may be used for calculation purposes.

<u>EC Measurement</u> - Prior to setting up a sample, an electrical conductivity measurement must be made for estimation of total dissolved solids. This estimate helps to determine the sample aliquot necessary to meet the efficiency vs. solids requirement.

Matrix Spike/Matrix Spike Duplicates - Matrix spike/matrix spike duplicates should be analyzed at a minimum frequency of ten percent. The acceptance limits shown in Section V must be met, unless matrix interference can be cited. Only NBS traceable standards may be used for spiking.

ital Radium, Natural Uranium, and Radioactive Strontium

These analytes are determined by EPA 900.1, EPA 908.0, and EPA 905.0, respectively quality control measures include the following:

- Background
- Calibration
- Matrix Spike/Matrix Spike Duplicates

These procedures are described below.

<u>Background</u> - Background samples are run daily prior to sample analysis, however a weekly average may be used for calculation purposes.

<u>Calibration</u> - One point calibration is sufficient for each batch of samples. Calibration factors are stable over time if no instrument parameters have changed. If the calibration factor differs from the running average by more than 20 percent, check the instrument and recount the standard or prepare new standard and recount. Only NBS traceable standards may be used.

Matrix Spike/Matrix Spike Duplicates - Matrix spike/matrix spike duplicates should be analyzed at a minimum frequency of ten percent. The acceptance limits listed in Section V must be met unless matrix interference can be cited. Only NBS traceable standards may be used.

don-222 and Tritium

These analytes are determined by EPA 913.0 and 906.0, respectively. Quality control measures include the following:

- Background
- Calibration
- Duplicate Analyses

These procedures are described below.

<u>Background</u> - Background samples must be run daily prior to sample analysis. Background are generally stable overtime, and must be below or less than ten percent above the historical average. If our of limits, the entire system must be checked for errors and contamination. The background requirements must be met, otherwise sample analysis cannot proceed.

<u>Calibration</u> - Three point calibration is required using NBS Traceable Standards only. Calibration factors must be within twenty percent Relative Standard Deviation. The calibration requirements must be met, otherwise sample analysis cannot proceed. If out of limits, the entire system must be checked for errors and contamination.

<u>Duplicate Analyses</u> - Duplicate analyses must be performed at a minimum frequency of ten percent. The limits listed in Section V must be met for tritium if the duplicate contains detectable amounts of tritium. Radon samples are field duplicates which may not meet the limits listed in Section V, however "poor duplication" must be cited on the report if the limits are not met.

I'trimetric Determination of Alkalinity

EPA

Titrimetric determination of alkalinity is performed according to

Method 310.1. Quality control procedures include the following:

- Titrant Standardization
- Laboratory Control Sample
- Duplicate Analyses

<u>Titrant Standardization</u> - The sulfuric Acid titrant is standardized against sodium carbonate.

<u>Laboratory Control Sample Analyses</u> - Alkalinity QC check standard is analyzed daily. Recovery within EPA stated limits is required for analyses to proceed.

<u>Duplicate Analyses</u> - A duplicate analysis is analyzed every ten samples. The duplicate analysis should include all sample preparation steps. Precision should be within twenty percent RPD, or $\pm 1/2$ detection limits.

(lorimetric Determination of Phosphate

Sample will be analyzed for EPA Method 365.2. Quality control procedures include the following:

- Calibration coefficient
- Analysis of Laboratory Control Samples
- Analysis of matrix spike/matrix spike duplicates

<u>Calibration</u> - A calibration curve is prepared daily, with verification.

<u>Laboratory Control Sample Analyses</u> - Analyze a laboratory control sample immediately after calibration. Recovery should be within ERA stated limits for analysis to proceed.

Matrix Spike/Matrix Spike Duplicates - For every sample matrix analyzed (minimum ten percent frequency), verification is required to ensure that chemical interference is not affecting color development. The spike recovery should be between 80 to 120 percent. Samples that suffer from matrix interferences shall be diluted and reanalyzed.

Cranide Analyses

Inorganic cyanide will be determined colorimetrically according to EPA Method 335.2 and SW846 Method 9010. Quality control procedures include:

- Calibration Verification
- Method Blank Analyses
- Analyses of Laboratory Control Samples
- Duplicate Analyses
- Analyses of Matrix Spiked Samples

<u>Calibration</u> - Calibration procedures are described in Section V. A calibration curve is prepared daily, with verification.

<u>Method Blank Analyses</u> - A minimum of one reagent blank per sample batch will be analyzed to determine if contamination or memory effects have occurred.

<u>Laboratory Control Sample Analyses</u> - A QC check sample, prepared independently of calibration standards, is analyzed daily. Recovery should be within ERA stated limits for analysis to proceed.

<u>Duplicate Analyses</u> - A duplicate analysis or matrix spike duplicate analysis should be run every ten samples. The duplicate run includes the whole sample preparation and analytical process. Precision should be within 20 percent RPD or +/-2 detection limits.

<u>Matrix Spike Analyses</u> - For each batch or matrix type (up to 20 samples), an aliquot of sample should be spiked and analyzed. Recovery of the spike should be within 25 percent of the amount added.

luoride Analyses

Fluoride analyses will be performed according to EPA Method 340.2. Quality control procedures include:

- Multipoint calibration
- Analyses of QC Check Samples
- Duplicate Analyses
- Analyses of Matrix Spiked Samples

<u>Calibration</u> - Calibration procedures are described in Section V. The method specified a daily multipoint calibration with verification.

<u>Laboratory Control Sample Analyses</u> - A QC check sample, prepared independently of calibration standards, should be analyzed daily. Recovery should be within ERA stated limits for analysis to proceed.

<u>Duplicate Analyses</u> - A duplicate analysis or matrix duplicate analysis should be run every ten samples. The duplicate run should include the whole sample preparation and analytical process. Precision should be within 20 percent RPD, or +/-1 detection limit.

<u>Matrix Spike Analyses</u> - For each batch or matrix type (minimum of ten percent), an aliquot of sample should be spiked and analyzed. Recovery of the spike should be within 20 percent of the amount added.

Turbidimetric Determination of Sulfate

Turbidimetric determination of sulfate is performed according to EPA Method 375.4 or SW846 Method 9038. Quality control procedures include the following:

- Multipoint Calibration
- QC Check Sample Analyses
- Duplicate Analyses
- Matrix Spike Analyses

<u>Multipoint Calibration</u> - A multipoint calibration curve will be prepared daily, as described in Section V.

<u>Laboratory Control Sample Analyses</u> - A sulfate QC check standard is analyzed daily. Recovery should be within ERA stated limits for analyses to proceed.

<u>Duplicate Analyses</u> - A duplicate analysis (or matrix spike duplicate) is analyzed every 10 samples. The duplicate analysis should include all sample preparation steps. Precision should be within 20 percent RPD, +/-1 detection limit.

Matrix Spike Analyses - For each batch of samples of a matrix type (20 maximum), an aliquot of sample will be spiked and analyzed. Recovery of the spike should be within 20 percent of the expected value; if not, the data will be flagged.

1 ste Extraction Test

The waste extraction test will be performed according to procedures described in the California Administrative Code, Section 66700. Quality control procedures include:

- Method Blank Analyses
- Duplicate Extractions

<u>Method Blank Analyses</u> - A minimum of one reagent blank per sample batch will be analyzed to determine if contamination or memory effects have occurred.

<u>Duplicate Extractions</u> - A duplicate extraction will be performed with every batch of samples, at a minimum frequency of ten percent. Results for analyses of the duplicate extracts will be used to estimate overall measurement variability.

SUMMARY OF CALIBRATION AND INTERNAL QUALITY CONTROL PROCEDURES FOR REPRESENTATIVE WET CHEMISTRY ANALYSES

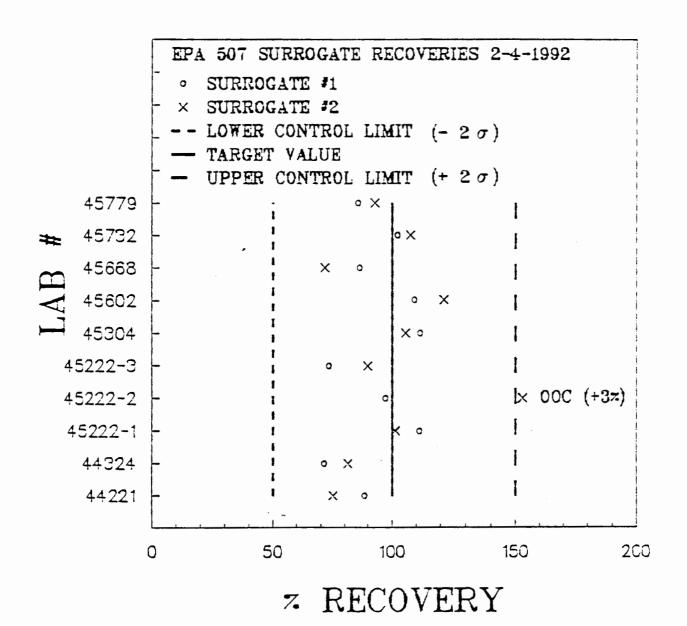
Parameter	Analytical Method	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
Conductane (aqueous)	120.1	Single-point calibration	Prior to sample analyses	Measured value within 2% of true value	 Repeat calibration See instrument manual
		QC Sample and after every 20 samples (minimum) two per set)	After calibration	Measured value within +10% of true value	 Repeat check Repeat calibration and check
		Duplicate analysis	5%	Coefficient of variation (CV) ≤ 10%	Obtain third value
Hardness	130.2	QC check sample	One per batch	+10%	 Evaluate system Repeat calibration
		Duplicate Spike	10% 10%	RPD <20%	 Obtain third value Flag data
pH (aqueous)	150.1	Two-point calibration	Daily prior to sample analyses	Reading within 0.05 pH units of buffer solution values	 Repeat calibration See instrument manual
		QC Sample	After calibration	Analysis within 0.2 pH units of true value	 Repeat check Repeat calibration and check
		Duplicate analysis	10%	Coefficient of variation (CV) ≤1%	Obtain third value

[ABL ↓ I-1]

SUMMARY OF CALIBRATION AND INTERNAL QUALITY CONTROL PROCEDURES (continued)

Parameter	Analytical Method	Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
TDS	160.1	QC check sample	One per batch	-10% recovery	Reanalyze samples
		Duplicate analysis	10%	RPD 20%	 Obtain third value Flag data
TSS	160.2	QC check sample	One per batch	+10% recovery	Reanalyze samples
		Duplicate analysis	10%	RPD 20%	 Obtain third value Flag data
Turbidity	180.1	Duplicate	10%	+ ≤20 RPD	 Obtain third value Flag data
Nitrate-N Ammonia-N	353.1 350.1	QC check sample	10%	ERA Values	 Evaluate system Repeat calibration
		Duplicate analysis	10%	RPD 20%	 Obtain third value Flag data
		Spike	10%	<u>+</u> 20%	1. Flag data
		Blank	Daily	<0.04 mg/L	
		Calibration	Daily	Corr. Coef. <u>></u> 0.995	

FGL CONTROL CHART



NOTE: OOC = OUT OF CONTROL

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INALYTICAL CHEMISTS

FIGURE VI-2

LAB

QUALITY CONTROL INSPECTION REPORT

•	Date: Time:	
QUALITY CONTROL	DEFICIENCIES OBSERVED	RECOMMENDATIONS CORRECTIONS

Inspector's Signature:

VII. Preventative Maintenance

A). Maintenance and Repair of Instruments

Routine maintenance of equipment is performed by the analyst when appropriate. Instrument maintenance and calibration is performed by qualified service technicians (usually service representatives of the instrument manufacturer). Instrument repair is also performed by these technicians and a record (containing the date, the nature of the problem, description of the repair, and the name of the technician) is also kept.

B). Good Laboratory Practices

Good laboratory practices are followed to prevent contamination of samples and standards. This includes the careful cleaning of glassware, and the use of disposable labware and containers when practical. Sample containers are monitored for contamination when received according to lot number and proposed use.

The deionized water is monitored by an automatic shut-off valve (at a set resistance of 500,000 ohms), checked monthly for pH, standard plate count, electrical conductivity, total dissolved solids, residual chlorine, and heavy metals (to include lead, cadmium, chromium, copper, nickel and zinc).

The analytical balances are certified once a year by a qualified specialist, and checked weekly using standard S weights.

All refrigerator, oven, and incubator temperatures are monitored daily, and all thermometers are checked for accuracy on a quarterly basis.

Fumehood velocities are checked monthly and sash marks are adjusted if necessary according to CAL OSHA regulations.

The pH meter is to be standardized on the day of use with two (2) buffer solutions (pH 4, 7 and/or 10).

The conductivity meter is to be standardized once a month with 0.01 N KCl solution.

The turbidity meter is to be standardized with standards before use. Standards are replaced yearly and checked with EPA check samples or equivalent commercial check samples.

The QA/QC Director must be notified immediately if any sign of malfunction occurs in any instrument so that he can decide if a qualified serviceman should be consulted.

In accordance with current regulations, hazardous materials are clearly labeled and Material Data Safety Sheets are available for employee inspection.

C. Performance and System Audits

Quality Control Inspections will be conducted quarterly. Quality Control spot checks are conducted weekly. Quality control spot check/inspection reports are kept on file in the QA Directors office. Photocopies of these reports are distributed to lab managers immediately following the inspections/spot checks. Corrective actions are expected to be implemented within 30 days of the inspection/spot check. Semi-annually, FGL, Inc. participates in EPA Performance Evaluation Studies and/or EPA inter laboratory comparison studies. FGL also conducts annual double-blind performance studies through environmental resource associates.

VIII. Data Reduction, Validation and Reporting

Before reporting, all data is qualified as being acceptable according to Internal Quality Control requirements (e.g. acceptance limits, holding times, preservation, etc...).

IX. Corrective Action in Out-of-Control Situations

The results obtained from the duplicate and the spiked samples should be within the acceptance limits. In the event of an out-of-control situation, the following (in order) should be investigated:

- 1). Check for errors in calculation
- 2). Check calibration and instrument performance. Prepare new standards if necessary.
- Reanalyze, if possible, the duplicate or spiked sample. (prepare a new spiked sample if necessary).

If there is insufficient sample for re-analysis, an alternate sample from the set may be analyzed as either a duplicate or a spiked sample.

If an instrument is not functioning properly, immediately notify the QA Director. If unavailable, then notify the lab manager. If neither are available, then post a notice on the instrument indicating "out of order" condition, and continue working with other instruments known to be functioning properly. Notify the QA Director as soon as possible.

Each work area has a corrective actions notebook. When corrective actions are necessary, an entry is made to the notebook identifying the problem, method, the analyst, and proposed corrective actions. After implementing the actions another entry is required to verify that the problem was solved. This process may need to be repeated in some situations. If matrix interference is the cause for the out of control situation the data may be reported with the appropriate explanation, and results reported as "estimated concentration".

X. Safety

FGL has a progressive safety program which meets all OSHA requirements, as well as those of Senate Bill #198. At all times FGL has the following materials readily available to it's employees:

- Material Safety Data Sheets
- OSHA Laboratory Standard Regulations
- FGL Emergency Action Plan
- FGL Chemical Hygiene Plan
- FGL Fire Prevention Plan
- FGL Hazard Communication Plan
- FGL Injury and Illness Prevention Plan

The above materials are available to outside parties upon request.

FGL holds monthly safety inspections and quarterly safety training sessions and safety committee meetings. At FGL, quality and safety go hand-in-hand.

DEPARTMENT OF HEALTH SERVICES

1151 BERKELEY WAY JERKELEY, CA 94704-1011

(510)540-2800



May 13, 1992

Cartificate No.: 1573

Mr. Darrell Nelson FGL Environmental P:0.Box 272 Santa Paula, CA 93061

Dear Mr. Nelson:

Enclosed is an updated copy of your ELAP Fields of Testing List. If you have any questions, please contact our office at (510) 540-2800.

Sincerely,

William R. Ray

Water/wastewater Laboratory Consultant

Environmental Laboratory Accreditation Program

Enclosure

ENVIRONMENTAL LABORATORY ACCREDITATION/REGISTRATION List of Approved Fields of Testing and Analytes

PHONE: (805) 659-0910 FGL Environmental/Santa Paula LABORATORY CATEGORY: Commercia CCUNTY: Ventura CERTIFICATE NUMBER: 1573 853 Corporation Street Santa Paula, CA 93060 1.0 Microbiology of Orinking Water and Wastewater -------(07-15-2) Fecal Coliforms by Multiple Tube Farmentation -----Y 1.6 Total Coliforms by MMO-MUG Drinking Water Only--M Tota Coliforms by Membrane Filter -----N 1.7 Fecal Coliforms by MMO-MUG Orinking Water Only--* Fecal Coliforms by Membrane Filter -----N 2.0 Inorganic Chemistry and Physical Properties of Orinking Water excluding Toxic Chemical Elements ------(07-15-91) 2.8 MBAS -----Alkalinity -----Y Calcium ------2.9 Nitrate ------2.2 2.10 Nitrite ------Chloride -----Y Corresivity -----Y 2.11 Scdfum -----fluorida ------y 2.12 Sulfata ------2.5 Hardness ------Y 2.5 2.13 Total Filterable residue and Conductivity -----Magnesium ------2.14 [ron (Colorimetric Only) ------2.7 2.15 Manganese (Colorimetric Only) ------------(07-15-91) Analysis of Toxic Chemical Elements in Orinking Water ----3.8 Manganese ------Arsanic -----Y Barium -----Y 3.9 Mercury ------3.2 Cadmium -----Y 3.10 Selenium ------3.3 Chromium, total -----y 3.11 Silver ------Copper -----Y 3.12 Iinc -----3.5 Iron -----Y 3.13 Aluminum ------3.8 Organic Chemistry of Drinking Water (measurement by GC/MS combination) -----(07-15-31) 4.0 4.3 Acid and Basa/Neutral Compounds ------4.2 Organic Chemistry of Drinking Hater (excluding measurements by GC/MS combination) -----(07-15-91) Total Trihalomethanes -----Y 5.1 Chlorinated pesticides -----Y 5.7 Polychiorinated Biphenyls ------Y Chlorophenoxy herbicides -----Y 5.3 Halogenared Volatiles -----N 5.4 Aromatic Volatiles -----N 8.0 Radiochemistry -----Gross alpha and beta and counting error -----Y 6.1 Total Radium ----Y 5.8 Radioactive Strontium ------6.9 Tritium -----6.10 Gamma emitting Isotopes -----N 5.4 Radon 222 -----Y 6.11 Gross Alpha by Co-precipitation -----N Radioactive Casium -----N 7.0 Shellfish Sanitation -----Shellfish meat Microbiology -----N 7.2 Paralytic Shellfish Poison -----Aquatic Toxicity Bioassays ----All Fresh Water: Static, Static, Renewal and Continuous Flow Bioassays; and Estuarine/Marine: Static, Static/Renewal, and Continuous Flow Bioassays Hazardous wastas Section 66696 (a) (4) ------N 8.2 Physical Properties Testing of Hazardous Waste Ignitability (Flashpoint determination Section 66702)

Page 2

Corrosivity - Corrosivity towards Reactivity (Section 66705)		
Inangania Chamiattu and Tavia Cha	emical Elements of Hazardous Hasta	
incident		7041(05-06-36)
Ansanic		7060(06-06-36)

Cadmium		7130(06-06-36) 7131(35-36-36)
		7190(05-06-86)
Cocalt	6010(05-05-86)	
Cooper	6010(37-!5-91)	7210(06-06-86)
		7420(06-05-86) 7421(05-06-86)
		7470(05-06-36)
		7570/06 20 20
		7740(05-06-36)
		7740(05-06-36)
	` ,	
		7.04 7.00 -00 7
		7950(06-06-86)
		7195(06-06-36)
		9010(25-06-36)
270	240 2/06 12 26)	
J -:UOF1Q834U.;(U/-[5-9])	340.2(05-13-66)	
Sulfide		9030(13-06-85)
1 Sulfide	ita	
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1 Sulfide	aste	
Sulfide	aste	
Sulfide	asta (axc'.ding measurements by GC/MS combination)	
Extraction Tests of Hazardous Was Section 66700 (WET) ————————————————————————————————————	asta	
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Extraction Tests of Hazardous Was Section 66700 (WET) ————————————————————————————————————	asta (measurement by GC/MS combination) asta (axciding measurements by GC/MS combi	
Sulfide	asta (meastrement by GC/MS combination) asta (exc'lding measurements by GC/MS combi	
1 Sulfide	aste (meas_rement by GC/MS combination) asta (excluding measurements by GC/MS combi	
Extraction Tests of Hazardous Has Section 66700 (WET)	asta (meas.rament by GC/MS combination) asta (exci.ding measurements by GC/MS combi	
Extraction Tests of Hazardous Was Section 66700 (WET)	asta (meas_rement by GC/MS combination) asta (exc`_ding measurements by GC/MS combi	
Extraction Tests of Hazardous Was Section 66700 (WET) ————————————————————————————————————	asta (measurement by GC/MS combination) asta (axciding measurements by GC/MS combination)	
Extraction Tests of Hazardous Was Section 66700 (WET) ————————————————————————————————————	asta (measurement by GC/MS combination) asta (axciding measurements by GC/MS combi	
Extraction Tests of Hazardous Has Section 66700 (WET)	asta (meas.rement by GC/MS combination) asta (axciding measurements by GC/MS combi	
Extraction Tests of Hazardous Has Section 66700 (HET)	asta (meas.rament by GC/MS combination) asta (exciding measurements by GC/MS combi	
Sulfide	asta (meas.rament by GC/MS combination) asta (exciding measurements by GC/MS combi	
Sulfide	asta (measurement by GC/MS combination) asta (axciding measurements by GC/MS combination) arile	

16.0	mastewater Inorganic Chemistry, Nutrients and Demand		(07-15-91
15.1	AcidityY	16.23	рн
15.2	AlkalinityY	16.24	Phenois
15.3	AmmoniaY	15.25	Phosphata, ortho-
15.4	Siochemical Oxygen Demand	16.25	Phosphorus, total
18.5	Boron	16.27	Pocassium
15.5	SromideY	15.29	Residue, Total
15.7	Calcium	16.29	Residue, Filterable (TDS)
15.3	3500	15.30	Residue, Nonfilterable (TSS)
16.9	Chemical Oxygen Demand	16.31	Residue, Settleable (SS)
15.10	Chloride	16.32	Residue, Volatile
	Chlorine Residual, totalY		Silica
15.12	Cyanide	15.34	Sodium
	Syanide amenable to Chlorination		Specific Conductance
	-iuoride		Sulfate
	Fardness		Sulfide (includes total and soluble)
15.15	fjeldahl NitrogenY	16.38	Sulfite
15.17	MagnesiumY	16.39	Surfactants (MBAS)
16.19	VitrateY	16.40	Tannin and Lignin
15.19	Yitrite	16.41	Turbidity
15.20	Off and Grease		Iron (Colorimetric Only)
15.21	Organic Carbon		Manganese (Colorimetric Only)
15.22	Oxygen, DissolvedY	15.44	TRPH
	"		TOX
17.0	Toxic Chemical Elements in Wastewater		(27-15-9)
17.1	4 luminum		Molybdenum
17.2	Ancimony		Nickel
17.3	Arsenic		Osmium
17.4	Sarium		Palladfum
17.5	Seryllium		Platinum
17.5	Cadmium	17.22	Rhodium
17.7	Chromium (VI)		Ruthenium
17.3	Chromium, total		Selenium
17.9	Cobalt		Silver
	CapperY		Strontium
17 !!	301d	17.27	Thallium
17.12		17.28	Tin
	For	17.29	Titanium
	Y	17.30	Vanadium
17.15	ManganeseY	17.31	Zinc
17 18	varcuryY	,,,,,	
,,,,	- Ci dai y		
18.0	Organic Chemistry of Wastewater (measurements by GC/	MS combination)	(27-15-91
19 1	Molarila Arganica		
18.2	Acid and Base/Neutral compounds		
19.0	Organic Chemistry of Wastewater (excluding measureme	nts by GC/MS combinat	ion)(97-15-91)
	Halogenated Volatiles	19.8	Organochlorine Pesticides
19.2	Aromatic VolatilesY	19.9	Polychlorinated Biphenyls
	Acrolein, Acrylonitrile, Acetonitrile	19.10	Nitroaromatics and Cyclic Ketones
19.4	PhenolsY	19.11	Polynuclear Aromatics
19.5	Benzidine	19.12	Haloethers
19.5	Phthalate Esters	19 13	Carbamates
19 7	Mitrosoamines	19 99	Chlorinated Herbicides
This	latoratory is also certified for additional hazardous	material fact catego	ries under Certificate No
11113	resolution & 19 disor describined for addictional metalliques	marei iei test cetego	
This	Isonophony is also contified for additional devalues	waten tene asternati	under Costificate No
11113	lacoratory is also certified for additional drinking	mater test categories	under Gercificate No.

APPENDIX F BLANK, DUPLICATE, AND SPIKE SAMPLE ANALYTICAL REPORTS

June 25, 1993

LAB No: SP 303120-2

Bermite Division of Whittaker 22116 W. Soledad Canyon Road

RE: Organic Analysis Matrix: Monitoring Well

Saugus , CA 91350

Sampling Site: Bermite 85-01.4 Sample Description: MW6/B/19 - 1A Sampled by : Abdun-Nur/Bricker

Sampled : June 9, 1993 Received: June 9, 1993

Container : Amber Glass TFE-Cap

Extracted: N/A

Preservatives:

Analyzed: June 11, 1993 QA/QC ID# : 930611 TOC-201A

TOTAL ORGANIC CARBON

CONSTITUENT	EPA METHOD	UNITS	SAMPLE DLR	SAMPLE RESULTS	LAB DLR	BLANK RESULTS
TOC	415.1	mg/L	0.5	ND	0.5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.) mg/L = Milligrams Per Liter (ppm) ND = Not Detected at or above the DLR.

See attached report for QA/QC data. If you have any questions please call.

FGL ENVIRONMENTAL

H. Neal Hutchison,

Organic Laboratory Manager

Darrell H. Nelson, B.S. Laboratory Director

June 25, 1993

LAB No: SP 303120-2

Bermite Division of Whittaker 22116 W. Soledad Canyon Road

RE: Organic Analysis Matrix: Monitoring Well

Saugus , CA 91350

Sampling Site: Bermite 85-01.4 Sample Description: MW6/C/19 - 1A Sampled by : Abdun-Nur/Bricker

Sampled : June 9, 1993

Container : Amber Glass TFE-Cap

Received: June 9, 1993 Extracted: N/A

Preservatives:

Analyzed: June 16, 1993 QA/QC ID# : 930616 TOX-201A

TOTAL ORGANIC HALOGENS

CONSTITUENT	EPA METHOD	UNITS	SAMPLE DLR	SAMPLE RESULTS	LAB DLR	BLANK RESULTS
TOX	9020	ug/L	5	ND	5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.) ug/L = Micrograms Per Liter (ppb) ND = Not Detected at or above the DLR.

See attached report for QA/QC data. If you have any questions please call.

FGL ENVIRONMENTAL

H. Neal Hutchison, B.S. Organic Laboratory Manager Darrell H. Nelson, B.S.

Laboratory Director

June 25, 1993

LAB No: SP 303120-2

Bermite Division of Whittaker 22116 W. Soledad Canyon Road

RE: Organic Analysis Matrix: Monitoring Well

Saugus , CA 91350

Sampling Site: Bermite 85-01.4 Sample Description: MW6/0/19 - 1A Sampled by : Abdun-Nur/Bricker

Sampled: June 9, 1993 Received: June 9, 1993

Container : Glass TFE-Cap

Extracted: N/A

Preservatives:

Analyzed: June 14, 1993 QA/QC ID# : 930614 601-301A

EPA METHOD 601

CONSTITUENT	SAMPLE	SAMPLE	LAB	BLANK
	DLR	RESULTS	DLR	RESULTS
	ug/L	ug/L	ug/L	ug/L
Trichloroethylene	0.5	ND	0.5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.) ug/L = Micrograms Per Liter (ppb) ND = Not Detected at or above the DLR.

See attached report for QA/QC data. If you have any questions please call.

FGL ENVIRONMENTAL

H. Neal Hutchison, B.S.

Organic Laboratory Manager

Darrell H. Nelson, B.S. Laboratory Director

June 25, 1993

LAB No: SP 303119-2

Bermite Division of Whittaker 22116 W. Soledad Canyon Road

RE: Organic Analysis Matrix: Monitoring Well

Saugus , CA 91350

Sampling Site: Bermite 85-01.4 Sample Description: MW5/B/19 - 1A Sampled by : Abdun-Nur/Bricker

: June 9, 1993 Sampled Received: June 9, 1993

Container : Amber Glass TFE-Cap

Extracted: N/A

Preservatives:

Analyzed: June 11, 1993 QA/QC ID# : 930611 TOC-201A

TOTAL ORGANIC CARBON

CONSTITUENT	EPA METHOD	UNITS	SAMPLE DLR	SAMPLE RESULTS	LAB DLR	BLANK RESULTS
TOC	415.1	mg/L	0.5	ND	0.5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.) mg/L = Milligrams Per Liter (ppm) ND = Not Detected at or above the DLR.

See attached report for QA/QC data. If you have any questions please call.

FGL ENVIRONMENTAL

H. Neal Hutchison, B.S.

Organic Laboratory Manager

Darrell H. Nelson, B.S. Laboratory Director

June 25, 1993

LAB No: SP 303119-2

Bermite Division of Whittaker 22116 W. Soledad Canyon Road

RE: Organic Analysis
Matrix: Monitoring Well

Saugus, CA 91350

Sampling Site: Bermite 85-01.4
Sample Description: MW5/C/19 - 1A
Sampled by : Abdun-Nur/Bricker

Sampled: June 9, 1993 Received: June 9, 1993

Container : Amber Glass TFE-Cap

Extracted: N/A

Preservatives:

Analyzed : June 16, 1993 QA/QC ID# : 930616 TOX-201A

TOTAL ORGANIC HALOGENS

CONSTITUENT	EPA METHOD	UNITS	SAMPLE DLR	SAMPLE RESULTS	LAB DLR	BLANK RESULTS
TOX	9020	ug/L	5	ND	5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)
ug/L = Micrograms Per Liter (ppb)
ND = Not Detected at or above the DLR.

See attached report for QA/QC data. If you have any questions please call.

FGL ENVIRONMENTAL

H. Neal Hutchison, B.S. Organic Laboratory Manager

Darrell H. Nelson, B.S. Laboratory Director

June 25, 1993

LAB No: SP 303119-2

Bermite Division of Whittaker 22116 W. Soledad Canyon Road

RE: Organic Analysis Matrix: Monitoring Well

Saugus , CA 91350

Sampling Site: Bermite 85-01.4 Sample Description: MW5/0/19 - 1A Sampled by : Abdun-Nur/Bricker

Sampled : June 9, 1993 Received : June 9, 1993

Container : Glass TFE-Cap

Extracted : N/A

Preservatives:

Analyzed: June 14, 1993 ·QA/QC ID# : 930614 601-301A

elilanson

EPA METHOD 601:

CONSTITUENT	SAMPLE	SAMPLE	LAB	BLANK
	DLR	RESULTS	DLR	RESULTS
	ug/L	ug/L	ug/L	ug/L
Trichloroethylene	0.5	ND	0.5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.) ND = Not Detected at or above the DLR. ug/L = Micrograms Per Liter (ppb)

See attached report for QA/QC data. If you have any questions please call.

FGL ENVIRONMENTAL

H. Neal Hutchison, B.S.

Organic Laboratory Manager

Darrell H. Nelson, B.S. Laboratory Director

June 25, 1993

QA/QC ID# 930614 601-301A

Bermite Division of Whittaker 22116 W. Soledad Canyon Road

RE: Organic Analysis

Saugus , CA 91350

Extracted: N/A

Analyzed: June 14, 1993

FGL Environmental Quality Assurance Report

EPA METHOD 601

	CONC. SPIKED	ACCURACY % RECOVERED			PRECISION % DIFFERENCE		
CONSTITUENT	ug/L	MS	MSD	AR	RPD	MAV	
Chlorobenzene	5.0	121	124	38-150	3.0	20.0	
1,3-Dichlorobenzene	5.0	103	108	7-187	5.0	20.0	
1,4-Dichlorobenzene	5.0	96	104	42-143	8.0	20.0	
1,2-Dichloroethane	5.0	98	115	51-147	16.0	20.0	
trans-1,2-Dichloroethylene	5.0	104	97	38-155	7.0	20.0	
1,2-Dichloropropane	5.0	104	111	44-156	6.0	20.0	
Tetrachloroethylene	5.0	94	100	26-162	6.0	20.0	
1,1,2-Trichloroethane	5.0	91	105	39-139	14.0	20.0	

MS = Matrix Spike AR = Acceptable Range

MSD = Matrix Spike Duplicate RPD = Relative Percent Difference Matrix = Laboratory Blank Water MAV = Maximum Acceptable Value

FGL ENVIRONMENTAL

Steve Castellano

Quality Assurance Director

June 25, 1993

Bermite Division of Whittaker 22116 W. Soledad Canyon Road Saugus , CA 91350 QA/QC ID# 930614 601-301A

RE: Organic Analysis

Extracted: N/A

Analyzed: June 14, 1993

FGL Environmental Quality Assurance Report

EPA METHOD 601

CONSTITUENT	CONC. SPIKED ug/L	ACCU % REC MS MSD	OVERED	PREC % DIFF RPD	ISION ERENCE MAV
Chlorobenzene 1,3-Dichlorobenzene 1,4-Dichlorobenzene 1,2-Dichloroethane trans-1,2-Dichloroethylene 1,2-Dichloropropane Tetrachloroethylene 1,1,2-Trichloroethane	5.0 5.0 5.0 5.0 5.0 5.0 5.0	121 124 103 108 96 104 98 115 104 97 104 111 94 100 91 105	7-187 42-143	3.0 5.0 8.0 16.0 7.0 6.0 6.0	20.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0

MS = Matrix Spike AR = Acceptable Range MSD = Matrix Spike Duplicate

RPD = Relative Percent Difference

Matrix = Laboratory Blank Water MAV = Maximum Acceptable Value

FGL ENVIRONMENTAL

Steve Castellano

Quality Assurance Director



June 25, 1993

Bermite Division of Whittaker 22116 W. Soledad Canyon Road Saugus , CA 91350

QA/QC ID# 930611 TOC-201A

RE: Organic Analysis

Extracted: N/A

Analyzed: June 11, 1993

FGL Environmental Quality Assurance Report

TOC METHOD

CONSTITUENT	CONC. SPIKED mg/L		ŀ	ACCURA RECOV MSD	ERED AR	PRECISION % DIFFERENCE RPD MAV	
тос	415.1 50.0		110	97	80-120	13.0	20.0

MS = Matrix Spike AR = Acceptable Range MSD = Matrix Spike Duplicate RPD = Relative Percent Difference Matrix = Laboratory Blank Water MAV = Maximum Acceptable Value

FGL ENVIRONMENTAL

Steve Castellano

Quality Assurance Director

PH: 805/659-0910 FAX: 805/525-4172

Office & Laboratory

2500 Stagecoach Road Stockton, CA 95215 PH: 209/942-0181 FAX 209/942-0423

Field Office

Visalia, CA PH: 209/734-9473 MOBILE: 209/738-6273

June 25, 1993

Bermite Division of Whittaker 22116 W. Soledad Canyon Road Saugus , CA 91350 QA/QC ID# 930614 601-301A

RE: Organic Analysis

Extracted: N/A

Analyzed: June 14, 1993

FGL Environmental Quality Assurance Report

EPA METHOD 601

	CONC. SPIKED			PRECISION % DIFFERENCE	
CONSTITUENT	ug/L	MS MSD	AR	RPD	MAV
Chlorobenzene	5.0	121 124	38-150	3.0	20.0
1,3-Dichlorobenzene	5.0	103 ,108	7-187	5.0	20.0
1,4-Dichlorobenzene	5.0	96 104	42-143	8.0	20.0
1,2-Dichloroethane	5.0	98 115	51-147	16.0	20.0
trans-1,2-Dichloroethylene	5.0	104 97	38-155	7.0	20.0
1,2-Dichloropropane	5.0	104 111	44-156	6.0	20.0
Tetrachloroethylene	5.0	94 100	26-162	6.0	20.0
1,1,2-Trichloroethane	5.0	91 105	39-139	14.0	20.0

MS = Matrix Spike
AR = Acceptable Range

MSD = Matrix Spike Duplicate

RPD = Relative Percent Difference

Matrix = Laboratory Blank Water MAV = Maximum Acceptable Value

FGL ENVIRONMENTAL

Steve Castellano

Quality Assurance Director



June 25, 1993

Bermite Division of Whittaker 22116 W. Soledad Canyon Road Saugus , CA 91350 QA/QC ID# 930616 TOX-201A

RE: Organic Analysis

Extracted: N/A

Analyzed: June 16, 1993

FGL Environmental Quality Assurance Report

TOX METHOD

CONSTITUENT	CONC. SPIKED ug/L		PRECISION % DIFFERENCE RPD MAV
тох	9020 100.0	61 * 85 80-120	33.0 20.0

MS = Matrix Spike
AR = Acceptable Range

MSD = Matrix Spike Duplicate
RPD = Relative Percent Difference

Matrix = Laboratory Blank Water
MAV = Maximum Acceptable Value

* Note: %Recovery and/or %Difference is out of acceptable limits, however, all other QC criteria were met.

FGL ENVIRONMENTAL

Steve Castellano

Quality Assurance Director

Visalia, CA PH: 209/734-9473 MOBILE: 209/738-6273



June 25, 1993

Bermite Division of Whittaker 22116 W. Soledad Canyon Road Saugus , CA 91350 QA/QC ID# 930616 TOX-201A

RE: Organic Analysis

Extracted: N/A

Analyzed: June 16, 1993

FGL Environmental Quality Assurance Report

TOX METHOD

CONSTITUENT		CONC. SPIKED ug/L		ACCURA RECOV MSD		PRECI % DIFFE RPD	
TOX	9020	100.0	61*	85	80-120	33.0	20.0

MS = Matrix Spike
AR = Acceptable Range

MSD = Matrix Spike Duplicate
RPD = Relative Percent Difference

Matrix = Laboratory Blank Water
MAV = Maximum Acceptable Value

* Note: %Recovery and/or %Difference is out of acceptable limits, however, all other QC criteria were met.

FGL ENVIRONMENTAL

Steve Castellano

Quality Assurance Director

,

PO Box 272 / 853 Corporation Street Santa Paula, CA 93061-0272 PH: 805/659-0910 2500 Stagecoach Road Stockton, CA 95215 PH: 209/942-0181

Visalia, CA PH: 209/734-9473 MOBILE: 209/738-6273

June 24, 1993

Bermite Division of Whittaker 22116 W. Soledad Canyon Road Saugus , CA 91350 QA/QC ID# 930614 601-301A

RE: Organic Analysis

Extracted: N/A

Analyzed: June 14, 1993

FGL Environmental Quality Assurance Report

EPA METHOD 601

CONSTITUENT	CONC. SPIKED ug/L		ACCUR/ RECOV MSD		PREC: % DIFFI RPD	ISION ERENCE MAV
Chlorobenzene	5.0	121	124	38-150	3.0	20.0
1,3-Dichlorobenzene	5.0	103	108	7-187	5.0	20.0
1,4-Dichlorobenzene	5.0	96	104	42-143	8.0	20.0
1,2-Dichloroethane	5.0	98	115	51-147	16.0	20.0
trans-1,2-Dichloroethylene	5.0	104	97	38-155	7.0	20.0
1,2-Dichloropropane	5.0	104	111	44-156	6.0	20.0
Tetrachloroethylene	5.0	94	100	26-162	6.0	20.0
1,1,2-Trichloroethane	5.0	91	105	39-139	14.0	20.0

MS = Matrix Spike AR = Acceptable Range MSD = Matrix Spike Duplicate

RPD = Relative Percent Difference

Matrix = Laboratory Blank Water

MAV = Maximum Acceptable Value

FGL ENVIRONMENTAL

Steve Castellano

Quality Assurance Director

June 25, 1993

Bermite Division of Whittaker 22116 W. Soledad Canyon Road

Saugus , CA 91350

QA/QC ID# 930614 601-301A

RE: Organic Analysis

Extracted: N/A

Analyzed: June 14, 1993

FGL Environmental Quality Assurance Report

EPA METHOD 601

CONSTITUENT	CONC. SPIKED ug/L		ACCUR/ RECOV MSD		PREC % DIFF RPD	ISION ERENCE MAV
Chlorobenzene 1,3-Dichlorobenzene 1,4-Dichlorobenzene 1,2-Dichloroethane trans-1,2-Dichloroethylene 1,2-Dichloropropane Tetrachloroethylene 1,1,2-Trichloroethane	5.0 5.0 5.0 5.0 5.0 5.0	121 103 96 98 104 104 94	124 108 104 115 97 111 100 105	38-150 7-187 42-143 51-147 38-155 44-156 26-162 39-139	3.0 5.0 8.0 16.0 7.0 6.0 6.0	20.0 20.0 20.0 20.0 20.0 20.0 20.0

MS = Matrix Spike

AR = Acceptable Range

MSD = Matrix Spike Duplicate

RPD = Relative Percent Difference

Matrix = Laboratory Blank Water MAV = Maximum Acceptable Value

FGL ENVIRONMENTAL

Steve Castellano

Quality Assurance Director

APPENDIX G

ANALYTICAL REPORTS FOR BACKGROUND WATER QUALITY, AND GROUND WATER MONITORING

June 24, 1993

LAB No: SP 303121-1

Bermite Division of Whittaker 22116 W. Soledad Canyon Road

RE: Inorganic Analysis

Saugus , CA 91350

Sampling Site: Bermite 85-01.4

Sample Description: MW1/A,H,N,S/19 Sampled by: Abdun-Nur/Bricker

Type of Sample: Monitoring Well

Sampled: June 9, 1993 Received: June 9, 1993 Completed: June 15, 1993

-QA/QC ID# : 930615 303121-2011

Analytical Results

CONSTITUENT	EPA METHOD	UNITS	DLR	RESULTS
Chloride Conductivity Fluoride Nitrate pH Sulfate	300.0 120.1 340.2 353.2 150.1 300.0	mg/L umhos/cm2 mg/L mg/L units mg/L	1 1 0.1 0.5 -	134 715 0.2 3.9 7.5

DLR = Detection Limit for Reporting Purposes. ND = Not Detected at or above the DLR. ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram Preservatives: (1) Cool 4°C Containers: (a) Plastic

If you have any questions please call.

Kurt Wilkinson, B.S. Inorganic Lab Manager

KW/DHN:tld

FGL ENVIRONMENTAL

Darrell H. Nelson, B.S.

Laboratory Director

June 25, 1993

LAB No: SP 303121-1

Bermite Division of Whittaker 22116 W. Soledad Canyon Road

RE: Organic Analysis Matrix: Monitoring Well

Saugus , CA 91350

Sampling Site: Bermite 85-01.4 Sample Description: MW1/B/19 Sampled by : Abdun-Nur/Bricker

Sampled : June 9, 1993 Received: June 9, 1993

Container : Amber Glass TFE-Cap

Extracted: N/A

Preservatives:

Analyzed: June 11, 1993 QA/QC ID# : 930611 TOC-201A

TOTAL ORGANIC CARBON

CONSTITUENT	EPA METHOD	UNITS	SAMPLE DLR	SAMPLE RESULTS	LAB DLR I	BLANK RESULTS
TOC	415.1	mg/L	0.5	ND	0.5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.) mg/L = Milligrams Per Liter (ppm) ND = Not Detected at or above the DLR.

See attached report for QA/QC data. If you have any questions please call.

FGL ENVIRONMENTAL

H. Neal Hutchison, B.S.

Organic Laboratory Manager

Darrell H. Nelson, B.S. Laboratory Director

Field Office

Visalia, CA

June 25, 1993

LAB No: SP 303121-1

Bermite Division of Whittaker 22116 W. Soledad Canyon Road

RE: Organic Analysis Matrix: Monitoring Well

Saugus , CA 91350

Sampling Site: Bermite 85-01.4 Sample Description: MW1/C/19 Sampled by: Abdun-Nur/Bricker

Sampled: June 9, 1993 Received: June 9, 1993

Container : Amber Glass TFE-Cap

Extracted: N/A

Preservatives:

Analyzed : June 16, 1993 QA/QC ID# : 930616 TOX-201A

TOTAL ORGANIC HALOGENS

CONSTITUENT	EPA METHOD	UNITS	SAMPLE DLR	SAMPLE RESULTS	LAB DLR	BLANK RESULTS
TOX	9020	ug/L	5	ND	5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)
ug/L = Micrograms Per Liter (ppb)

ND = Not Detected at or above the DLR.

See attached report for QA/QC data. If you have any questions please call.

FGL ENVIRONMENTAL

H. Neal Hutchison, B.S.

Organic Laboratory Manager

Darrell H. Nelson, B.S.

Laboratory Director

June 25, 1993

LAB No: SP 303121-1

Bermite Division of Whittaker 22116 W. Soledad Canyon Road RE: Inorganic Analysis

Saugus , CA 91350

Sampling Site: Bermite 85-01.4 Sample Description: MW1/E/19 Sampled by: Abdun-Nur/Bricker Type of Sample: Monitoring Well

Sampled: June 9, 1993 Received: June 9, 1993 'Completed: June 25, 1993

QA/QC ID# : 930625 303121-201A

Analytical Results

CONSTITUENT	EPA METHOD	UNITS.	DLR	RESULTS	MCL
Gross Alpha Gross Beta	900.0 900.0	pCi/L pCi/L		0.4 ± 1 0.7 ± 2	

DLR = Detection Limit for Reporting Purposes. ND = Not Detected at or above the DLR. ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram Preservatives: (1) Cool 4°C Containers: (a) Plastic

If you have any questions please call.

FGL ENVIRONMENTAL

Kurt Wilkinson, B.S. Inorganic Lab Manager

S. Darrell H. Nelson, B.S. ger Laboratory Director

KW/DHN:tld

June 25, 1993

LAB No: SP 303121-1

Bermite Division of Whittaker 22116 W. Soledad Canyon Road

RE: Organic Analysis Matrix: Monitoring Well

Saugus , CA 91350

Sampling Site: Bermite 85-01.4 Sample Description: MW1/0/19 Sampled by : Abdun-Nur/Bricker

Sampled : June 9, 1993 Received: June 9, 1993

Container : Glass TFE-Cap Preservatives:

Extracted: N/A

Analyzed: June 14, 1993 QA/QC ID# : 930614 601-301A

EPA METHOD 601

CONSTITUENT	SAMPLE	SAMPLE	LAB	BLANK
	DLR	RESULTS	DLR	RESULTS
	ug/L	ug/L	ug/L	ug/L
Trichloroethylene	0.5	ND ,	0.5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.) ug/L = Micrograms Per Liter (ppb) ND = Not Detected at or above the DLR.

See attached report for QA/QC data. If you have any questions please call.

FGL ENVIRONMENTAL

H. Neal Hutchison, B.S.

Organic Laboratory Manager

Darrell H. Nelson, B.S. Laboratory Director

June 24, 1993

LAB No: SP 303121-1

Bermite Division of Whittaker 22116 W. Soledad Canyon Road

RE: Inorganic Analysis

Saugus , CA 91350

Sampling Site: Bermite 85-01.4 Sample Description: MW1/R,U/19 Sampled by : Abdun-Nur/Bricker Type of Sample: Monitoring Well

Sampled : June 9, 1993 Received: June 9, 1993 Completed: June 18, 1993

QA/QC ID# : 930618 303121-201M

Analytical Results

CONSTITUENT	EPA METHOD	UNITS	DLR	RESULTS
Iron	6010	mg/L	0.05	0.25
Lead	7421	mg/L	0.01	ND
Manganese	6010	mg/L	0.03	ND
Sodium	6010	mg/L	1	52

DLR = Detection Limit for Reporting Purposes. ND = Not Detected at or above the DLR. ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram Preservatives: (1) Cool 4°C Containers: (a) Plastic

If you have any questions please call.

Kurt Wilkinson, B.S.

Inorganic Lab Manager

Darrell H. Nelson, B.S. Laboratory Director

FGL ENVIRONMENTAL

KW/DHN:tld

June 24, 1993

LAB No: SP 303121-1

Bermite Division of Whittaker 22116 W. Soledad Canyon Road

RE: Inorganic Analysis

Saugus , CA 91350

Sampling Site: Bermite 85-01.4 Sample Description: MW1/T/19 Sampled by: Abdun-Nur/Bricker Type of Sample: Monitoring Well

Sampled: June 9, 1993 Received: June 9, 1993 Completed: June 11, 1993

QA/QC ID# : 930611 303121-201E

Analytical Results

CONSTITUENT	EPA METHOD	UNITS	DLR	RESULTS	MCL
Turbidity	180.1	NTU	0.2	0.4	5

DLR = Detection Limit for Reporting Purposes. ND = Not Detected at or above the DLR. ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram Preservatives: (1) Cool 4°C Containers: (a) Plastic

If you have any questions please call.

FGL ENVIRONMENTAL

Kurt Wilkinson, B.S.

Inorganic Lab Manager

KW/DHN:tld

Darrell H. Nelson, B.: Laboratory Director

June 24, 1993

LAB No: SP 303117-1

Bermite Division of Whittaker 22116 W. Soledad Canyon Road

RE: Inorganic Analysis

Saugus , CA 91350

Sampling Site: Bermite 85-01.4

Sample Description: MW3/A,H,N,S/19 Sampled by : Abdun-Nur/Bricker

Type of Sample: Monitoring Well

Sampled: June 9, 1993 Received: June 9, 1993 Completed: June 15, 1993

QA/QC ID# : 930615 303117-2011

Analytical Results

CONSTITUENT	EPA METHOD	UNITS	DLR	RESULTS
Chloride	300.0	mg/L	1	28
Conductivity	120.1	umhos/cm2	1	627
Fluoride	340.2	mg/L	0.1	0.2
Nitrate	300.0	mg/L	0.5	1.6
рН	150.1	units	-	7.6
Sulfate	300.0	mg/L	1	70

DLR = Detection Limit for Reporting Purposes. ND = Not Detected at or above the DLR. ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram Preservatives: (1) Cool 4°C Containers: (a) Plastic

If you have any questions please call.

Kurt Wilkinson, B.S. Inorganic Lab Manager

KW/DHN:tld

FGL ENVIRONMENTAL

Darrell H. Nelson, B.S.

Laboratory Director

June 24, 1993

LAB No: SP 303117-1

Bermite Division of Whittaker 22116 W. Soledad Canyon Road

RE: Organic Analysis Matrix: Monitoring Well

Saugus , CA 91350

Sampling Site: Bermite 85-01.4 Sample Description: MW3/B/19 Sampled by : Abdun-Nur/Bricker Container : Amber Glass TFE-Cap

Sampled: June 9, 1993 Received: June 9, 1993

Extracted: N/A

Preservatives:

Analyzed: June 11, 1993 QA/QC ID# : 930611 TOC-201A

TOTAL ORGANIC CARBON

CONSTITUENT	EPA METHOD	UNITS	SAMPLE DLR	SAMPLE RESULTS	LAB BLANK DLR RESULTS
	415.1	mg/L	0.5	ND	0.5 ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.) ND = Not Detected at or above the DLR. mg/L = Milligrams Per Liter (ppm)

See attached report for QA/QC data. If you have any questions please call.

FGL ENVIRONMENTAL

H. Neal Hutchison, B.S. Organic Laboratory Manager Darrell H. Nelson, B.S. Laboratory Director

June 24, 1993

LAB No: SP 303117-1

Bermite Division of Whittaker 22116 W. Soledad Canyon Road

RE: Organic Analysis Matrix: Monitoring Well

Saugus , CA 91350

Sampling Site: Bermite 85-01.4 Sample Description: MW3/C/19 Sampled by : Abdun-Nur/Bricker

Sampled : June 9, 1993 Received: June 9, 1993

Container : Amber Glass TFE-Cap

Extracted: N/A

Preservatives:

Analyzed: June 16, 1993 QA/QC ID# : 930616 TOX-201A

TOTAL ORGANIC HALOGENS

CONSTITUENT	EPA METHOD	UNITS	SAMPLE DLR	SAMPLE RESULTS	LAB DLR	BLANK RESULTS
TOX	9020	ug/L	5	ND	5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.) ug/L = Micrograms Per Liter (ppb) ND = Not Detected at or above the DLR.

See attached report for QA/QC data. If you have any questions please call.

FGL ENVIRONMENTAL

H. Neal Hutchison, B.S.

Organic Laboratory Manager

Dárrell H. Nelson, B.S. Laboratory Director

June 25, 1993

LAB No: SP 303117-1

Bermite Division of Whittaker 22116 W. Soledad Canyon Road

RE: Inorganic Analysis

Saugus , CA 91350

Sampling Site: Bermite 85-01.4 Sample Description: MW3/E/19 Sampled by : Abdun-Nur/Bricker Type of Sample: Monitoring Well

Sampled : June 9, 1993 Received: June 9, 1993 Completed: June 25, 1993

-QA/QC ID# : 930625 303117-201A

Analytical Results

CONSTITUENT	EPA METHOD	UNITS	DLR	RESULTS	MCL
Gross Alpha Gross Beta	900.0 900.0	pCi/L pCi/L		2 ± 1 1 ± 2	

DLR = Detection Limit for Reporting Purposes. ND = Not Detected at or above the DLR. ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram Preservatives: (1) Cool 4°C Containers: (a) Plastic

If you have any questions please call.

Kurt Wilkinson, B.S. Inorganic Lab Manager

KW/DHN:tld

FGL ENVIRONMENTAL

Darrell H. Nelson, B.S.

Laboratory Director

June 24, 1993

LAB No: SP 303117-1

Bermite Division of Whittaker 22116 W. Soledad Canyon Road

RE: Organic Analysis Matrix: Monitoring Well

Saugus , CA 91350

Sampling Site: Bermite 85-01.4 Sample Description: MW3/0/19 Sampled by : Abdun-Nur/Bricker Container : Glass TFE-Cap

Sampled: June 9, 1993 Received: June 9, 1993

Preservatives:

Extracted: N/A

Analyzed : June 14, 1993 QA/QC ID# : 930614 601-301A

EPA METHOD 601

CONSTITUENT	SAMPLE	SAMPLE	LAB	BLANK
	DLR	RESULTS	DLR	RESULTS
	ug/L	ug/L	ug/L	ug/L
Trichloroethylene	0.5	ND	0.5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.) ug/L = Micrograms Per Liter (ppb) ND = Not Detected at or above the DLR.

See attached report for QA/QC data. If you have any questions please call.

FGL ENVIRONMENTAL

H. Neal Hutchison, B.S.

Organic Laboratory Manager

Darrell H. Nelson, B.S. Laboratory Director

June 24, 1993

LAB No: SP 303117-1

Bermite Division of Whittaker

RE: Inorganic Analysis

22116 W. Soledad Canyon Road Saugus , CA 91350

Sampling Site: Bermite 85-01.4 Sample Description: MW3/R,U/19 Sampled by : Abdun-Nur/Bricker Type of Sample: Monitoring Well

Sampled : June 9, 1993 Received: June 9, 1993 Completed: June 18, 1993

QA/QC ID# : 930618 303117-201M

Analytical Results

CONSTITUENT	EPA METHOD	UNITS	DLR	RESULTS
Iron	6010	mg/L	0.05	0.05
Lead	7421	mg/L	0.01	ND
Manganese	6010	mg/L	0.03	ND
Sodium	6010	mg/L	1	48

DLR = Detection Limit for Reporting Purposes. ND = Not Detected at or above the DLR. ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram Preservatives: (1) Cool 4°C Containers: (a) Plastic

If you have any questions please call.

Kurt Wilkinson, B.S.

Inorganic Lab Manager

KW/DHN:tld

FGL ENVIRONMENTAL

Darrell H. Nelson, B.S.

Laboratory Director

June 24, 1993

LAB No: SP 303117-1

Bermite Division of Whittaker 22116 W. Soledad Canyon Road

RE: Inorganic Analysis

Saugus, CA 91350

Sampling Site: Bermite 85-01.4 Sample Description: MW3/T/19 Sampled by : Abdun-Nur/Bricker Type of Sample: Monitoring Well

: June 9, 1993 Sampled Received: June 9, 1993 Completed: June 11, 1993

QA/QC ID# : 930611 303117-201E

Analytical Results

CONSTITUENT	EPA METHOD	UNITS	DLR	RESULTS	MCL
Turbidity	180.1	NTU	0.2	ND	5

ND = Not Detected at or above the DLR. DLR = Detection Limit for Reporting Purposes. ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram Preservatives: (1) Cool 4°C Containers: (a) Plastic

If you have any questions please call.

FGL ENVIRONMENTAL

Kurt Wilkinson, B.S.

Inorganic Lab Manager

KW/DHN:tld

Darrell H. Nelson, B.S. Laboratory Director

June 24, 1993

LAB No: SP 303119-1

Bermite Division of Whittaker 22116 W. Soledad Canyon Road

RE: Inorganic Analysis

Saugus, CA 91350

Sampling Site: Bermite 85-01.4 Sample Description: MW5/A,H/19 Sampled by: Abdun-Nur/Bricker Type of Sample: Monitoring Well

Sampled: June 9, 1993 Received: June 9, 1993 Completed: June 11, 1993

QA/QC ID# : 930611 303119-2011

Analytical Results

CONSTITUENT	EPA METHOD	UNITS	DLR	RESULTS
Chloride	300.0	mg/L	1 1	35
Conductivity	120.1	umhos/cm2		528
pH	150.1	units	1	7.7
Sulfate	300.0	mg/L		36

DLR = Detection Limit for Reporting Purposes. ND = Not Detected at or above the DLR. ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram Preservatives: (1) Cool 4°C Containers: (a) Plastic

If you have any questions please call.

Kurt Wilkinson, B.S.

Inorganic Lab Manager

KW/DHN:tld

FGL ENVIRONMENTAL

Darrell H. Nelson, B.S.

Laboratory Director

June 25, 1993

LAB No: SP 303119-1

Bermite Division of Whittaker 22116 W. Soledad Canyon Road

RE: Organic Analysis Matrix: Monitoring Well

Saugus, CA 91350

Sampling Site: Bermite 85-01.4 Sample Description: MW5/B/19 Sampled by : Abdun-Nur/Bricker Container : Amber Glass TFE-Cap

Sampled : June 9, 1993 Received: June 9, 1993

Preservatives:

Extracted: N/A

Analyzed: June 11, 1993 QA/QC ID# : 930611 TOC-201A

TOTAL ORGANIC CARBON

CONSTITUENT	EPA METHOD	UNITS	SAMPLE DLR	SAMPLE RESULTS	LAB DLR	BLANK RESULTS
ТОС	415.1	mg/L	0.5	ND	0.5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.) mg/L = Milligrams Per Liter (ppm) ND = Not Detected at or above the DLR.

See attached report for QA/QC data. If you have any questions please call.

FGL ENVIRONMENTAL

H. Neal Hutchison, B.S.

Organic Laboratory Manager

Darrell H. Nelson, B.S. Laboratory Director

June 25, 1993

LAB No: SP 303119-1

Bermite Division of Whittaker 22116 W. Soledad Canyon Road

RE: Organic Analysis Matrix: Monitoring Well

Saugus, CA 91350

Sampling Site: Bermite 85-01.4 Sample Description: MW5/C/19

Sampled : June 9, 1993 Received: June 9, 1993

Sampled by : Abdun-Nur/Bricker Container : Amber Glass TFE-Cap

Extracted: N/A

Preservatives:

Analyzed: June 16, 1993 QA/QC ID# : 930616 TOX-201A

TOTAL ORGANIC HALOGENS

CONSTITUENT	EPA METHOD	UNITS	SAMPLE DLR	SAMPLE RESULTS	LAB DLR	BLANK RESULTS
тох	9020	ug/L	5	ND	5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.) ug/L = Micrograms Per Liter (ppb) ND = Not Detected at or above the DLR.

See attached report for QA/QC data. If you have any questions please call.

FGL ENVIRONMENTAL

H. Neal Hutchison, B.S.

Organic Laboratory Manager

Darrell H. Nelson, B.S. Laboratory Director

June 25, 1993

LAB No: SP 303119-1

Bermite Division of Whittaker 22116 W. Soledad Canyon Road RE: Organic Analysis
Matrix: Monitoring Well

Saugus , CA 91350

Sampling Site: Bermite 85-01.4 Sample Description: MW5/0/19 Sampled by: Abdun-Nur/Bricker Container: Glass TFE-Cap

Sampled: June 9, 1993 Received: June 9, 1993

Preservatives:

Extracted: N/A

Analyzed : June 14, 1993 QA/QC ID# : 930614 601-301A

EPA METHOD 601

CONSTITUENT	SAMPLE	SAMPLE	LAB	BLANK
	DLR	RESULTS	DLR	RESULTS
	ug/L	ug/L	ug/L	ug/L
Trichloroethylene	0.5	ND	0.5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)

ug/L = Micrograms Per Liter (ppb)

ND = Not Detected at or above the DLR.

See attached report for QA/QC data. If you have any questions please call.

FGL ENVIRONMENTAL

H. Neal Hutchison, B.S. Organic Laboratory Manager

Darrell H. Nelson, B.S. Laboratory Director

June 24, 1993

LAB No: SP 303119-1

Bermite Division of Whittaker 22116 W. Soledad Canyon Road

RE: Inorganic Analysis

Saugus , CA 91350

Sampling Site: Bermite 85-01.4 Sample Description: MW5/R/19 Sampled by : Abdun-Nur/Bricker Type of Sample: Monitoring Well

Sampled : June 9, 1993 Received: June 9, 1993 Completed: June 17, 1993

QA/QC ID# : 930617 303119-201M

Analytical Results

CONSTITUENT	EPA METHOD	UNITS	DLR	RESULTS
Iron	6010	mg/L	0.05	0.16
Manganese Sodium	6010 6 010	mg/L mg/L	0.03 1	ND 54

ND = Not Detected at or above the DLR. DLR = Detection Limit for Reporting Purposes. ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram Preservatives: (1) Cool 4°C Containers: (a) Plastic

If you have any questions please call.

Kurt Wilkinson, B.S.

Inorganic Lab Manager

KW/DHN:tld

FGL ENVIRONMENTAL

Darrell H. Nelson, B.S.

Laboratory Director

June 24, 1993

LAB No: SP 303120-1

Bermite Division of Whittaker

22116 W. Soledad Canyon Road

Saugus, CA 91350

RE: Inorganic Analysis

Sampling Site: Bermite 85-01.4 Sample Description: MW6/A,H/19 Sampled by : Abdun-Nur/Bricker Type of Sample: Monitoring Well

: June 9, 1993 Sampled Received: June 9, 1993 Completed: June 11, 1993

QA/QC ID# : 930611 303120-2011

Analytical Results

CONSTITUENT	EPA METHOD	UNITS	DLR	RESULTS
Chloride	300.0	mg/L	1	58
Conductivity	120.1	umhos/cm2	1	548
pH	150.1	units	-	7.7
Sulfate	300.0	mg/L	1	26

DLR = Detection Limit for Reporting Purposes. ND = Not Detected at or above the DLR. ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram Preservatives: (1) Cool 4°C Containers: (a) Plastic

If you have any questions please call.

Kurt Wilkinson, B.S.

Inorganic Lab Manager

KW/DHN:tld

FGL ENVIRONMENTAL

Darrell H. Nelson, B.S.

Laboratory Director

June 25, 1993

LAB No: SP 303120-1

Bermite Division of Whittaker 22116 W. Soledad Canyon Road

:RE: Organic Analysis Matrix: Monitoring Well

Saugus, CA 91350

Sampling Site: Bermite 85-01.4

Sample Description: MW6/B/19 Sampled by : Abdun-Nur/Bricker

Container : Amber Glass TFE-Cap

Preservatives:

Sampled: June 9, 1993 Received: June 9, 1993

Extracted: N/A

Analyzed: June 11, 1993 QA/QC ID# : 930611 TOC-201A

TOTAL ORGANIC CARBON

CONSTITUENT	EPA METHOD	UNITS	SAMPLE DLR	SAMPLE RESULTS	LAB DLR	BLANK RESULTS
	415.1	mg/L	0.5	ND	0.5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.) mg/L = Milligrams Per Liter (ppm) ND = Not Detected at or above the DLR.

See attached report for QA/QC data. If you have any questions please call.

FGL ENVIRONMENTAL

H. Neal Hutchison, B.S. Organic Laboratory Manager

Ɗarrell H. Nelson, B.S. Laboratory Director

June 25, 1993

LAB No: SP 303120-1

Bermite Division of Whittaker 22116 W. Soledad Canyon Road

RE: Organic Analysis Matrix: Monitoring Well

Saugus , CA 91350

Sampling Site: Bermite 85-01.4 Sample Description: MW6/C/19 Sampled by : Abdun-Nur/Bricker

: June 9, 1993 Sampled Received: June 9, 1993

Container : Amber Glass TFE-Cap Preservatives:

Extracted: N/A

Analyzed: June 16, 1993 QA/QC ID# : 930616 TOX-201A

TOTAL ORGANIC HALOGENS

CONSTITUENT	EPA METHOD	UNITS	SAMPLE DLR	SAMPLE RESULTS	LAB DLR	BLANK RESULTS
TOX	9020	ug/L	5	ND	5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.) ug/L = Micrograms Per Liter (ppb) ND = Not Detected at or above the DLR.

See attached report for QA/QC data. If you have any questions please call.

FGL ENVIRONMENTAL

H. Neal Hutchison, B.S. Organic Laboratory Manager

Darrell H. Nelson, B.S. Laboratory Director

June 25, 1993

LAB No: SP 303120-1

Bermite Division of Whittaker 22116 W. Soledad Canyon Road

RE: Organic Analysis Matrix: Monitoring Well

Saugus, CA 91350

Sampling Site: Bermite 85-01.4 Sample Description: MW6/0/19 Sampled by : Abdun-Nur/Bricker

Sampled: June 9, 1993 Received: June 9, 1993

Container : Glass TFE-Cap

Extracted: N/A

Preservatives:

Analyzed: June 14, 1993 QA/QC ID# : 930614 601-301A

EPA METHOD 601.

CONSTITUENT	SAMPLE	SAMPLE	LAB	BLANK
	DLR	RESULTS	DLR	RESULTS
	ug/L	ug/L	ug/L	ug/L
Trichloroethylene	0.5	ND	0.5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.) ug/L = Micrograms Per Liter (ppb) ND = Not Detected at or above the DLR.

See attached report for QA/QC data. If you have any questions please call.

FGL ENVIRONMENTAL

H. Neal Hutchison, B.S.

Organic Laboratory Manager

Darrell H. Nelson, B.S. Laboratory Director

June 24, 1993

LAB No: SP 303120-1

Bermite Division of Whittaker 22116 W. Soledad Canyon Road

RE: Inorganic Analysis

Saugus , CA 91350

Sampling Site: Bermite 85-01.4 Sample Description: MW6/R/19 Sampled by : Abdun-Nur/Bricker Type of Sample: Monitoring Well

Sampled : June 9, 1993 Received: June 9, 1993 Completed: June 17, 1993

QA/QC ID# : 930617 303120-201M

Analytical Results

CONSTITUENT	EPA METHOD	UNITS	DLR	RESULTS
Iron	6010	mg/L	0.05	0.21
Manganese	6010	mg/L	0.03	ND
Sodium	6010	mg/L	1	56

DLR = Detection Limit for Reporting Purposes. ND = Not Detected at or above the DLR. ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram Preservatives: (1) Cool 4°C Containers: (a) Plastic

If you have any questions please call.

FGL ENVIRONMENTAL

Kurt Wilkinson, B.S. Inorganic Lab Manager

KW/DHN:tld

Darrell H. Nelson, B.S.

Laboratory Director

June 24, 1993

LAB No: SP 303118-1

Bermite Division of Whittaker 22116 W. Soledad Canyon Road 'RE: Inorganic Analysis

Saugus, CA 91350

Sampling Site: Bermite 85-01.4 Sample Description: MW10/A,H/19 Sampled by: Abdun-Nur/Bricker Type of Sample: Monitoring Well

Sampled: June 9, 1993 Received: June 9, 1993 Completed: June 11, 1993

QA/QC ID# : 930611 303118-2011

Analytical Results

CONSTITUENT	EPA METHOD	UNITS	DLR	RESULTS
Chloride	300.0	mg/L	1	66
Conductivity	120.1	umhos/cm2	1	629
pH	150.1	units	-	7.8
Sulfate	300.0	mg/L	1	45

DLR = Detection Limit for Reporting Purposes. ND = Not Detected at or above the DLR. ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram Preservatives: (1) Cool 4°C Containers: (a) Plastic

If you have any questions please call.

Kurt Wilkinson, B.S.

Inorganic Lab Manager

KW/DHN:tld

FGL ENVIRONMENTAL

Darrell H. Nelson, B.S.

Laboratory Director

June 25, 1993

LAB No: SP 303118-1

Bermite Division of Whittaker 22116 W. Soledad Canyon Road

RE: Organic Analysis Matrix: Monitoring Well

Saugus , CA 91350

Sampling Site: Bermite 85-01.4 Sample Description: MW10/B/19

Sampled by : Abdun-Nur/Bricker Container : Amber Glass TFE-Cap

Preservatives:

: June 9, 1993 Sampled Received: June 9, 1993

Extracted: N/A

Analyzed: June 11, 1993 QA/QC ID# : 930611 TOC-201A

TOTAL ORGANIC CARBON

CONSTITUENT	EPA METHOD	UNITS	SAMPLE DLR	SAMPLE RESULTS	LAB DLR	BLANK RESULTS
TOC	415.1	mg/L	0.5	ND	0.5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.) ND = Not Detected at or above the DLR. mg/L = Milligrams Per Liter (ppm)

See attached report for QA/QC data. If you have any questions please call.

FGL ENVIRONMENTAL

H. Neal Hutchison, B.S.

Organic Laboratory Manager

Ɗarrell H. Nelson, B.S. Laboratory Director

June 25, 1993

LAB No: SP 303118-1

Bermite Division of Whittaker 22116 W. Soledad Canyon Road

RE: Organic Analysis Matrix: Monitoring Well

Saugus , CA 91350

Sampling Site: Bermite 85-01.4 Sample Description: MW10/C/19 Sampled by: Abdun-Nur/Bricker

Sampled: June 9, 1993 Received June 9, 1993

Container : Amber Glass TFE-Cap

Extracted: N/A

Preservatives:

Analyzed : June 16, 1993 QA/QC ID# : 930616 TOX-201A

TOTAL ORGANIC HALOGENS

CONSTITUENT	EPA METHOD	UNITS	SAMPLE DLR	SAMPLE RESULTS	LAB DLR	BLANK RESULTS
TOX	9020	ug/L	5	ND	5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)

ug/L = Micrograms Per Liter (ppb)

ND = Not Detected at or above the DLR.

See attached report for QA/QC data. If you have any questions please call.

FGL ENVIRONMENTAL

H. Neal Hutchison, B.S.

Organic Laboratory Manager

Darrell H. Nelson, B.S. Laboratory Director

June 25, 1993

Bermite Division of Whittaker 22116 W. Soledad Canyon Road

Saugus , CA 91350

LAB No: SP 303118-1

RE: Organic Analysis Matrix: Monitoring Well

Sampling Site: Bermite 85-01.4 Sample Description: MW10/0/19 Sampled by : Abdun-Nur/Bricker

Container : Glass TFE-Cap

Preservatives:

: June 9, 1993 Sampled Received: June 9, 1993

Extracted: N/A

Analyzed: June 14, 1993 QA/QC ID# : 930614 601-301A

EPA METHOD 601

CONSTITUENT	SAMPLE	SAMPLE	LAB BLANK
	DLR	RESULTS	DLR RESULTS
	ug/L	ug/Ļ	ug/L ug/L
Trichloroethylene	0.5	ND	0.5 ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.) ug/L = Micrograms Per Liter (ppb) ND = Not Detected at or above the DLR.

See attached report for QA/QC data. If you have any questions please call.

FGL ENVIRONMENTAL

H. Neal Hutchison, B.S. Organic Laboratory Manager

Darrell H. Nelson, B.S. Laboratory Director

June 25, 1993

LAB No: SP 303118-1

Bermite Division of Whittaker 22116 W. Soledad Canyon Road RE: Inorganic Analysis

Saugus, CA 91350

Sampling Site: Bermite 85-01.4 Sample Description: MW10/R/19 Sampled by: Abdun-Nur/Bricker Type of Sample: Monitoring Well

Sampled: June 9, 1993 Received: June 9, 1993 Completed: June 17, 1993

QA/QC ID# : 930617 303118-201M

Analytical Results

CONSTITUENT	EPA METHOD	UNITS	DLR	RESULTS
Iron	6010	mg/L	0.05	0.34
Manganese	6010	mg/L	0.03	ND
Sodium	6010	mg/L	1	87

DLR = Detection Limit for Reporting Purposes. ND = Not Detected at or above the DLR. ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram Preservatives: (1) Cool 4°C Containers: (a) Plastic

If you have any questions please call.

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FGL ENVIRONMENTAL

Kurt Wilkinson, B.S. Inorganic Lab Manager

Inorganic Lab riana

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Darrell H. Nelson, B.S. Laboratory Director

APPENDIX H STATISTICAL ANALYSES

TABLE H-1 NINETEENTH QUARTER SAMPLING EVENT

Parameter	Units	Tolerance Limit	Well No.				
				MW-6	MW-10		
Chloride	mg/l	162	35	58	66		
pН		6.98/8.07	7.7	7.7	7.8		
Specific Conductance	μmhos/c	736	528	548	629		
Sulfate	mg/l	105	36	26	45		
TCE	μg/l	0.5ª	ND ^b	ND	ND		
TOC	mg/l	3.95	ND	ND	ND		
TOX	μg/l	72.7	ND	ND	ND		

^{*}Tolerance limit set at detection limit.

Note: All tolerance limits are upper limits except pH which has both upper and lower limits. ^bND = Not detected.

TABLE H-2

CONCENTRATIONS FOR BACKGROUND MONITORING PARAMETERS
IN BACKGROUND MONITORING WELL MW-1

Weil	Date	Quarter	pH*	Conductance (µmhos/cm)	TOC* (mg/l)	ΤΟΧ* (μg/l)	SO ₄ ² (mg/l)	Cl ⁻ (mg/l)
MW-1	10/04/88	1	7.5	598	<3	< 100	11	
	01/25/89	2	7.48	572	2.4 ^b	<100	22	
	04/17/89	3	7.2		<3	<100	11	
	07/27/89	4	7.48	500	2.4 ^b	<100	13	
	10/31/89	5	7.6	524	<3	<100	10	83
	01/25/90	6	7.4	570	<3	< 100	16	85
	04/17/90	7	7.55	504	<4	<20	11	88
	07/17/90	8	8.28	530	<4	<20	10	82
	10/18/90	9	7.4	544	<1	75 ^b	23	98
	01/29/91	10	7.5	573	1.4	<5	8	96
	04/23/91	11	7.68	559	1.8	<5	10	100
	07/19/91	12	7.33	575	1.2	<5	11	97
	10/08/91°							
	03/13/92	14	7.5	639	0.4 ^b	<5	13	131
	04/21/92	15	7.5	643	<0.5	<5	9	130
	07/29/92	16	7.55	660	<0.5	6.9	11	133
	10/20/92	17	7.5	676	< 0.5	<5	10	138
	01/27/93	18	7.68	707	< 0.5	<5	6	137
	06/09/93 ^d	19	7.5	715	<0.5	<5	9	134

^{*}Each value is the average result from four replicate samples.

The replicates included a portion with results below the detection limit. The average was calculated after assigning a value of one-half the detection limit for the samples below the detection limit.

^{&#}x27;Not sampled because water elevation dropped below elevation of sampling pump intake.

^dSingle sample. Replicates no longer taken.

TABLE H-3

CONCENTRATIONS FOR BACKGROUND MONITORING PARAMETERS
IN BACKGROUND MONITORING WELL MW-3

Well	Date	Quarter	pH*	Conductance ^ε (μmhos/cm)	TOC* (mg/l)	ΤΟΧ' (μg/l)	SO ₄ ² (mg/l)	Cl ⁻ (mg/l)
MW-3	10/04/88	1	7.48	699	<3	361.25	73	
	01/25/89	2	7.73	664	<3	<100	74	
	04/17/89	3	7.3		<3	<100	9	
	07/27/89	4	7.5	661	<3	<100	65	
	10/31/89	5	7.53	617	<3	<100	68	35
	01/25/90	6	7.18	641	7.15	<100	74	36
	04/17/90	7	7.38	590	<4	< 20	60	46
	07/17/90	8	8.23	589	<4	<20	67	39
	10/18/90	9	7.63	642	0.7 ^b	<100	15	34
	01/29/91	10	7.28	656	2.2	<5	80	54
	04/23/91	11	7.55	629	2.0	<5	77	34
	07/19/91	12	7.23	633	1.3	<5	85	45
	10/09/91	13	7.65	642	<0.5	<5	34	37
	03/13/92	14	7.45	648	0.6	3.3 ^b	85	33
	04/21/92	15	7.5	644	<0.5	<5	81	37
	07/29/92	16	7.55	643	0.34 ^b	<5	74	33
	10/20/92	17	7.55	641	<0.5	<5	67	34
	01/27/93	18	7.6	640	<0.5	<5	69	30
	06/09/93°	19	7.6	627	< 0.5	<5	70	28

^{*}Each value is the average result from four replicate samples.

The replicates included a portion with results below the detection limit. The average was calculated after assigning a value of one-half the detection limit for the samples below the detection limit. Single sample. Replicates no longer taken.

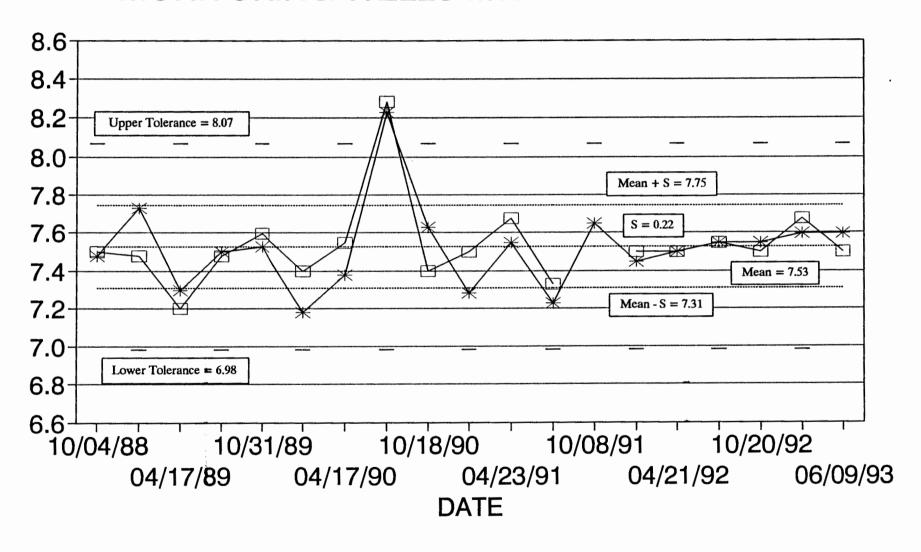
TABLE H-4
TOLERANCE LIMIT CALCULATIONS

	pН	Conductance	TOC	TOX	Chloride	Sulfate
Σχ	278.55	21594	48.34	767.70	2,087	1,441
n (number of samples)	37	35	37	36	29	37
x (mean)	7.5	617	1.3	21.3	72	38.9
s (sample standard deviation)	0.22	55.2	1.23	23.8	40.2	30.9
k (from tables)	2.472	2.166	2.15	2.158	2.234	2.15
Upper Tolerance Limit ^a	8.07	736.56	3.95	72.7	162	105
Lower Tolerance Limit ^b	6.98					

^aUpper Tolerance Limit = $\bar{x} + ks$.

^bLower Tolerance Limit = $\bar{x} - ks$.

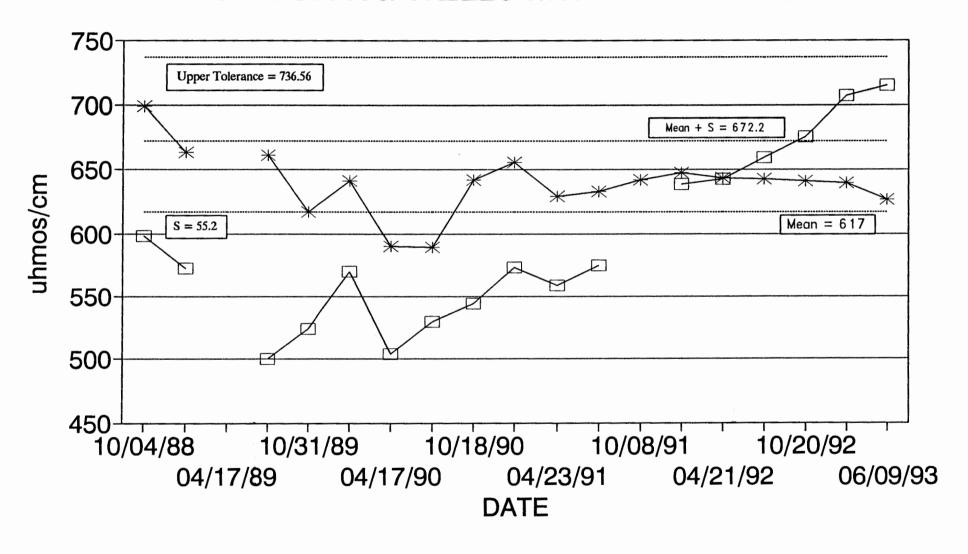
pH MONITORING WELLS MW-1 AND MW-3



—— MW-1 —— MW-3

SPECIFIC CONDUCTANCE

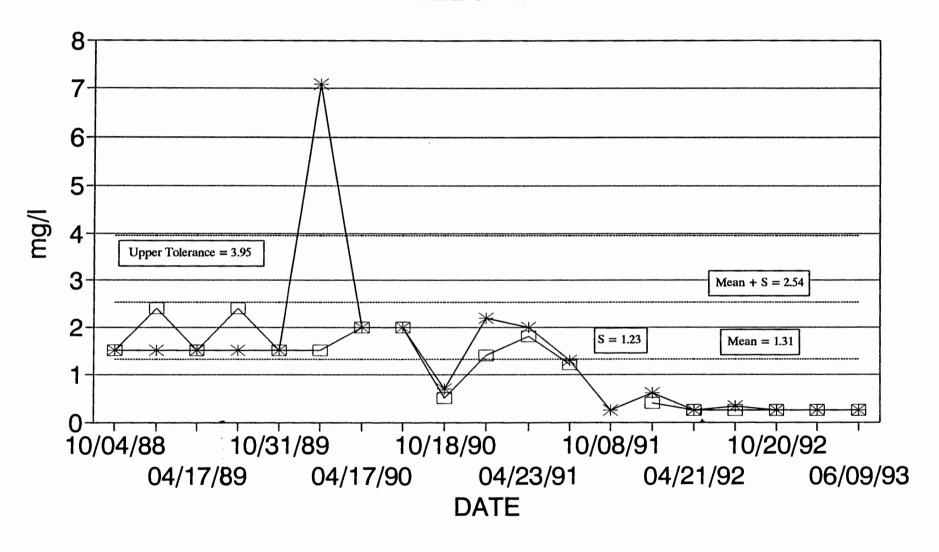
MONITORING WELLS MW-1 AND MW-3

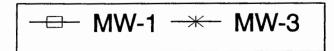


— MW-1 → MW-3

TOTAL ORGANIC CARBON

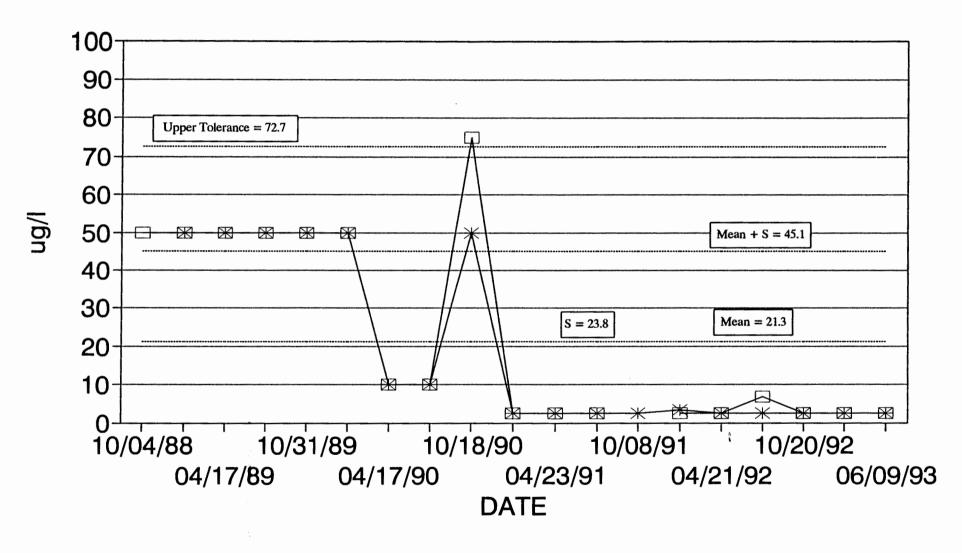
MONITORING WELLS MW-1 AND MW-3





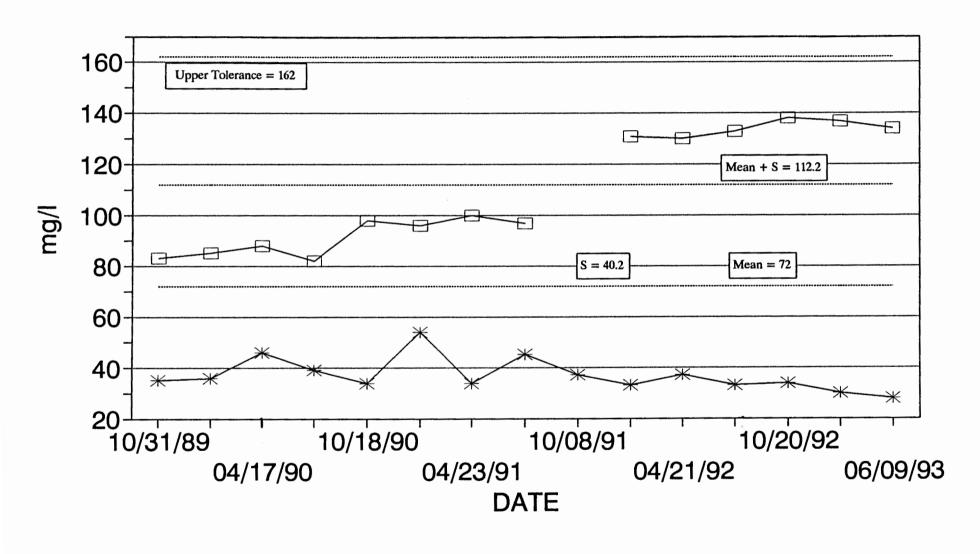
TOTAL ORGANIC HALOGEN

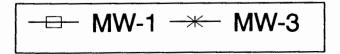
MONITORING WELLS MW-1 AND MW-3



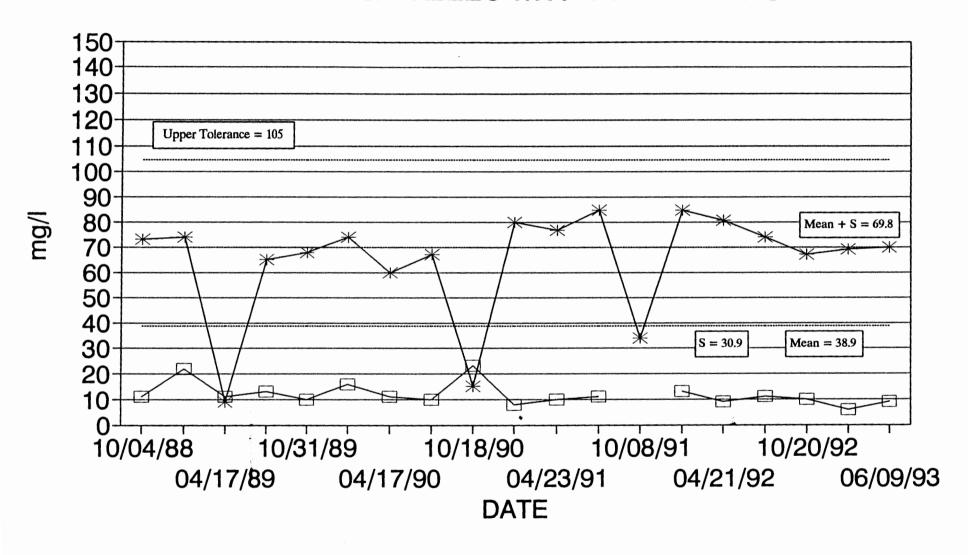
— MW-1 — MW-3

CHLORIDE MONITORING WELLS MW-1 AND MW-3





SULFATE MONITORING WELLS MW-1 AND MW-3



—— MW-1 —— MW-3